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List of Supportive Documents (3.3.1)

SR.NO.	PARTICULARS	Academic Year	PAGE NO.
1.	**NIL**	2018-19	--
2.	Research Paper Published by Dr. Shubhada Deshpande	2019-20	03-17
3.	NIL	2020-21	--
4.	Research Paper Published by Ms. Prajakta Borgaonkar	2021-22	18-22
5.	Research Paper Published by Ms. Smita More	2022-23	23-28
	Research Paper Published by Ms. Prajakta Borgaonkar	2022-23	29-31
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Hinglish Hamari Identity: The Language of Advertising in India

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Hinglish Hamari Identity: The Language of Advertising in India

Abstract

The paper deals with code-mixing in the present-day advertisements in the print as well as on the electronic media. Hinglish has become the popular language among youngsters not only in the megacities but even in the rural India. India is in the phase of Endonormative stabilization of English where the language has mingled with the local hue of indigenous languages thus establishing a new identity. The English language we find around us is thus an amalgam of not only various Indian languages and the native English, but also of two or more cultures. The world of advertisement reflects the same social reality of India. The multinational brands like Pepsi could realize this and preferred to go with the local sentiments by using Hinglish language to popularise their products.

Keywords: Hinglish, language of advertisements, fusion, Endonormative Stabilization, acculturation, code-switching

The paper thus attempts to analyse the linguistic dimensions of some of the exemplary commercial advertisements on both- the print as well as the electronic media. It further analyses the types of words that are localized in an English advertisement or vice versa, i.e.,

English words being accommodated in a Hindi advertisement. The purpose of using such a fusion of local and Western language is also probed. The socio-cultural as well as historical background of the advertisements in the newspaper and on the electronic media is also discussed so as to search for parallelisms, if any.

A small questionnaire was administered to the students from regional medium background to know about their responses to such fusion of two languages in the advertisements.

The paper concludes on a positive note stating that such a fusion of Hindi and English should not be looked upon as a threat to the existing languages, but it is an inevitable process in the history of language development.

The researcher begins with a personal experience, narrated in first person that led her towards the theme of this paper.

"The language spoken by my children is far different from the version I used to speak in their age or even when I was a college student. Their expressions are multilingual, i.e., a mixture of Marathi, Hindi and English. The impact of English syntax on their Marathi language further adds to what language teachers would consider as 'impurity' of their mother tongue. My daughter once said to me, 'माझ्या बर्थडेवर तू केला होतास तसा केक कर'. She was transliterating, i.e., applying the syntactic pattern of English to Marathi because the syntax of Marathi entails the suffix 'ला' being added to the noun, which in Marathi would have been 'वाढदिवस', meaning 'birthday'. Firstly, she was using an English word for 'वाढदिवस' (which is a very common phenomenon in India because even an illiterate maid uses this expression to such an extent that one can doubt whether she knows the original Marathi word or not.). Secondly, she was applying the rule of English syntax which entails the preposition 'on' to be prefixed to the noun 'birthday'. By the process of transliteration, she therefore changes the suffix to 'वर', the Marathi equivalent of 'on'.

The researcher's reason for the above personal narration is that the paper intends to analyse the code mixing in the present-day advertisements in the print as well as electronic media. The illustration of transliteration mentioned above should highlight this fusion of Indian language and English. The humour is further underlined as the researcher also mixes the codes/scripts to enhance the impact of her expression. Though the example of transliteration in the beginning illustrates a mixing of Marathi and English, Hinglish (a fusion of Hindi and English) as a linguistic version commonly observed in Indian advertisements forms the major scope of this paper to be encompassed.

The paper thus attempts to analyse the linguistic dimensions of some of the exemplary commercial advertisements on both- the print as well as the electronic media. It begins with a review of literature which includes the definition of Hinglish as put forward by researchers like Parshad, Bhowmich, Chand et al (2015) and then leads to the rationale behind the spread of Hinglish as a language of popular commercial advertisements. It then discusses the motivation of Indians for speaking and using the English language. The paper further reviews Schneider's (2003) model of the processes the New Englishes have undergone and refers to the Endonormative stage of stabilization that English is undergoing presently. This reference to Schneider's model thus establishes a view in support of the increasing use of Hinglish in the advertisements.

The paper further analyses the types of words that are localized in an English advertisement or vice versa, i.e., English words being accommodated in a Hindi advertisement. The purpose of using such a fusion of local and Western language is also probed. The socio-cultural as well as historical background of the advertisements in the newspaper and on the electronic media is also discussed so as to search for parallelisms, if any.

The paper ends with a small informal survey conducted by the researcher in the form of interviews with 16 students in the age group of 14-16 studying in regional language as the medium of instruction. The paper thus examined the responses of these students to the fusion of Hindi and English in advertisements.

It is important to review the work of Indian researchers in the field. Parshad, Bhowmick, Chand et al (2015:5) mention Hinglish as "a colloquial umbrella-term spanning isolated borrowings, indigenized Indian English forms, within otherwise Monolingual Hindi or English, to rich code-switching practices unintelligible to Monolingual Hindi or English speakers." Prof. Thussu, in an interview with BBC, mentions that major multinational companies try to sell their products in Hinglish. It is the mass media, according to him, like Hindi films, advertisements that try to promote such fusion of English as a language of international communication and Hindi, the most widely used language in the country for reasons like reaching out to a larger and more varied audience.

According to Bhatia & Ritchie (2006b:518, cited in Kathpalia and Ong: 2015:5), in the present scenario, the sociolinguists look at language mixing as 'a systematic and rule-governed phenomenon which satisfies the creative needs of bilinguals. According to them, these are the needs which cannot be satisfied by 'single, separate linguistic systems' that they know.

Luna & Peracchi (2005a, 2005b cited in Kathpalia and Ong: 2015:2) state that such a fusion of languages not only appeals to bilinguals but it also offers new ways for the copywriters to experiment with new creative ways of utilising the resources of both the languages.This would 'achieve special socio-psychological effects. Such a fusion of languages, if used along with figures of speech like puns and metaphors enhances 'brand recall and positive attitudes' as mentioned by McQuarrie & Mick (1993, cited in Kathpalia and Ong :2015:5).

As Chand (2016) has rightly pointed out, there are two main reasons for wide and increasing use of Hinglish. First reason being the fact that fluency in English is always looked upon as a matter of social prestige in India and the people here are motivated to use the language for both- the instrumental as well as integrative reasons. There has also been an increasing shift in the psychological set up of Indian learners of English from instrumental to integrative motivation for speaking English as a means of 'upward social mobility.'

The second reason mentioned by Chand is the limited opportunities and exposure to the language. Due to both reasons, Hinglish is one of the 'communication styles' easily and more readily available to the masses and hence the faster growth and spread of the version. A research undertaken by Chand and her colleagues (2015 cited in Chand:2016) argues that Hinglish is taking over full English fluency in India and that the population speaking Hinglish fills 'a niche between monolingual Hindi and full bilingualism'. This, according to them, is

because it assures a fulfilment of the need for 'a modern, yet localized way speaking' that will facilitate communication even for masses.

Many researchers have of course expressed concern about emergence of Hinglish, a hybrid code. According to them, it might lead to the dilution of one or more languages. In this connection, it is appropriate to refer to the model presented by Schneider (2003) which explains the shared processes which all the New Englishes have gone through. The model outlines five stages of changes:

- Foundation
- Exonormative stabilization
- Nativization
- Endonormative Stabilization
- Differentiation

The third phase, Nativization, is considered to be the most vibrant realization of the fact that something fundamental is changing. It is during this phase that a New English starts constructing its own identity which is different from the native variety.

Endonormative stabilization is a phase characterized by a gradual adoption and acceptance of an indigenous linguistic norm supported by a new locally rooted self-confidence.

In the Indian context, one finds such an endonormative stabilization of English where the language has mingled with the local hue of indigenous languages thus establishing a new identity. The English language we find around us is thus an amalgam of not only various Indian languages and the native English, but also of two or more cultures. One can call it the process of acculturation wherein both the languages reciprocally impact each other. Intertwining of two cultures and languages lead to a third altogether different reality called the non-native variety of English. In case of India, the cultural ownership is no more

restricted to the educated elite class, but even other strata of society would like to make it their 'own' language.

It is this cultural trait of the present times that is skilfully exploited by the commercial world not only in India but even at the multinational level. Bhana (2014) stated that for anybody wanting to export and market any product or service to India, Hinglish is something one should consider important. Hinglish being one of the world's most potent Anglo-hybrids, it is considered to be the key to advertising success in India. One can observe code-switching as a common practice on television channels and radio stations as well as in music and movies. This is further enhanced by an easy and cheaper access to television and internet thus leading to the spread of Hinglish to rural areas.

According to Bhana (2014), it is necessary for a businessman who wants to do business in India to note that the customers here are most receptive to Hinglish. Especially for

the urban young generation, it corresponds with their own identity and therefore not using it may lead to be a social blunder that can cause embarrassment.

The saga of Hinglish advertising started with Pepsi playing around with linguistic fusion in 1990. The tagline "Yehi hai right choice, baby!" (You've got the right one, baby!) changed the outlook of Indians towards Hinglish from a dumb, poor variety of English to a lively representation of the young India. This advertisement proved to be the most successful in the history of the organization. The same popularity was enjoyed by one more such tagline for the same product advertised by the world-famous master blaster Sachin Tendulkar as it said, "Yeh dil maange more!" (The heart wants more).

One more such tagline that could catch the attention of the younger generation is the one by Domino's for their mouth-watering Pizza. "Hungry Kya?" (Are you Hungry?) is an example of how a short and simple but linguistically mixed message can have a magical impact on the viewers. "Pal banaye magical" (It makes every moment magical) is one more such example wherein the organization rightly touched the nerve of the targeted audience to sell their tangy eatable- Lays. Similarly, the commercial visual for Coca Cola exploited

the same technique by using the fusion of these two languages in "Life ho to aisi" (That's what life should be like). Sunsilk shampoo was also presented to the young girls with a catchy line "Come on girls, waqt hai shine karne ka!"(Come on, girls, it's time to shine). "Kya aap Close Up karate hain?" (Do you use Close Up?) tagline of the well-known toothpaste or the one advertising Hero Motocorp – "Hum mein hai hero" (There is a hero in every one of us) have followed the same path and technique to be successful in advertising their products.

All these above taglines use Hindi lexis and syntax but condition it with a word or two in English. The selection of English words displays the advertisers' very good sense of human psyche as only the main words in the sentence which play an important syntactic as

well as semantic role in the structure are borrowed from English. These are usually the lexical words and not the functional words. These can be either nouns, adjectives or verbs (e.g. shine, hero, life, magical, etc.)

Lexical Words Borrowed from English in Hinglish Taglines

Sr. No.	Brand	Lexical Word/s Borrowed from English
1.	Pepsi	Right choice, baby
2.	Pepsi	More (as an adjective in this context)
3.	Domino's	Hungry
4.	Lays	magical
5.	Coca-Cola	Life
6.	Sunsilk	Come on, Girls!, shine
7.	Close-Up	Close Up
8.	Hero Motocorp	Hero
9.	Freshwrapp	Fresh
10.	ICICI Prudential Mutual Fund	Market
11.	Volini	Expert

The English words used in these expressions reflect the scenario very commonly observed in India. Not only in the mega cities or small towns but even in the rural parts of the country, people weave in some English words in their routine conversation in their specific regional language or in Hindi. Hinglish has thus become a part of daily life and culture of every Indian irrespective of whether s/he belongs to urban or rural India.

Some of the advertising taglines mentioned above are used to advertise multi-national brands. Ashok Chakravarty, the creative head of Publicis India, (cited in Bhana, 2014) provides a rationale for this choice of Hinglish by foreign multi nationals in India that

majority of Indians' lack of proficiency in English makes it necessary for the multi nationals to resort to such a fusion of Hindi and English.

The June 2018 issue of Reader's Digest, a well-known magazine in English, contains 6 advertisements which have their tagline in Hindi. In spite of it being a magazine in English language catering to upper middle-class readers, the issue includes such dvertisements in the L1 as the publishers are aware that the concepts of these advertisements made an motional appeal. For example, the advertisement of the capsule Revital is a mixture of English and Hindi. The page is full of English descriptions of the product as well as the tagline "Live life to the fullest" followed by an attractive, unconventional phrase in Hindi without any punctuations – "ThaknaManaHai" (You are not allowed to be tired). Freshwrapp aluminium foil has been advertised with a tagline in Hinglish, i.e., Hindi syntax accommodating an English word- "Khaana jobhi ho, fresh ho!" (The food you eat should be fresh) followed by a paragraph describing the product in English. Similarly, ICICI Prudential Mutual Fund advertisement is a fusion of Hinglish, English and Hindi with a question in Hinglish "Ab market ke utar-chadhav ka darr kaisa?" (Why should one be scared of upheavals in the market?) followed by a long space on the page being occupied by English language with one short tagline in Hindi (scripted in English) – "Tarakki Karein!" (Let's progress). "Jab Kamar Dard Sataye Sirf Expert Kaam Aaye" (When lower back pain troubles you, it is only the expert who helps you) is one more such Hinglish tagline that advertises Volini, a pain reliever, followed by all details of the product in English. Sleepwell products are also advertised with a Hindi tagline "Ek koshish, Maa jaisa aaram dene ki..." (An attempt, to provide motherly comfort.) followed by the description in English.

Interestingly, these Hinglish or Hindi taglines are printed in bold, colourful fonts separately either along with the picture or at the beginning or at the end. It is interesting to note that the Reader's Digest targets largely middle/upper middle-class readers, who are

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extremely comfortable in English. Despite this, it is interesting that the advertisers have consciously chosen Hinglish taglines in order to appeal to the reader's emotions and to help them identify with the modern Indian who is comfortable with a blend of languages and cultures.

In order to know how these Hinglish advertisements are taken by the teenagers with regional medium background, the researcher administered a small questionnaire to 16

students studying in a Marathi medium school in Vikhroli, a suburb in Mumbai. They were asked whether the language of advertisements should be Hindi, English or Hinglish. 10 (62.5%) of them replied in favour of Hinglish. 12 (75%) of them reported that they find advertisements in Hinglish more interesting as the fusion of both the languages, one being their own national language, makes it easier for them to understand difficult concepts in English.

These responses by the students from regional medium background are reflective enough of the present social situation in India. These are the youngsters who would be the generation taking the language further. The advertisements on the television and in the newspaper around 1980s had upper and middle classes as their target audience and so English used to be the choice of language for their advertisements. However, the present times have witnessed the all-pervasive advent of electronics and the media which has reached even the lower socio-economic strata. The son of a household help proudly feels that he is a part of future modern generation that will blend languages and so enjoys speaking a fusion of languages as well as finds a Hinglish advertisement interesting. In addition to this socio-psychological reason, such a liking for fusion of languages also helps him express himself better and understand an expression which would otherwise be difficult with the use of only Hindi or only English language.

The researcher, therefore, concludes that by using such a fusion, the advertising companies address the need within such social strata to take a step up the social ladder by taking recourse to English. The researchers in the field of language and education policy makers, therefore, need not consider such a fusion as a threat to the existing language but as an inevitable process and a reflection of social reality in the present times as an aftermath of globalization and an interaction among various cultures and languages. It is necessary to understand the huge gap between the formal training of languages being taught in the schools and the exposure that the students get to code mixing through popular media like television commercials and movies. The teachers and the syllabus framers, according to the researcher,

need to ponder over this aspect of inclusive nature of languages as well as the strategies used by the students while speaking/ writing in English as well as Indian languages.

These inclusive and accommodative manifestations of the languages pave the way for further research, by widening the scope of research that is otherwise limited to single language studies. It would thus be interesting to conclude this paper with a reference by Acharya (March 2018) to a recent report by The Telegraph mentioning that Portsmouth College in the UK has introduced 'Hinglish' as a new course to help British aspirant students do business in India. This is because, as mentions The Telegraph, such an introduction to this fusion would enable and prepare the students for the international opportunities in 'the world's seventh largest economy' that is faster than any other economy in the world.

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_The_Case_of_Philippine_TV_Commercials

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Thin Film and Photo-Electrochemical Studies of ZnSe and CdZnSe Alloys

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Abstract: **The *Abstract:* In these studies, pure ZnSe and ternary CdZnSe thin films were deposited onto glass and stainless- steel substrate by Chemical Bath deposition method. The structure and surface morphology of these as- deposited films were analyzed by X-ray diffraction (XRD) and Scanning Electron Microscopy (SEM) techniques. The structural studies revealed that ZnSe and CdZnSe thin films were polycrystalline in nature and cubic (Zinc blend) structures. The structural parameters like lattice constant, crystallite size, internal strain, dislocation density were calculated. The SEM micrographs showed these films were composed of spherical shaped crystallites and EDX studies confirmed the elemental composition. Optical investigations showed high absorption coefficients and the energy band gap decreased from 2.81eV to 2.27eV when Cd^{+2} are incorporated in ZnSe lattice. Photoelectrochemical parameters were obtained for semiconductor-electrolyte junction selecting ZnSe and CdZnSe as photoanodes and Polysulphide as an electrolyte. The photocurrent, photo potential and quantum conversion efficiency were found to be enhanced significantly after adding Cd^{+2} to ZnSe lattice.**

Index Terms: **ZnSe, CdZnSe thin films, XRD, SEM, EDX, PEC.**

I. Introduction

The research on conversion of optical energy into a clean and renewable energy leads to development of various photovoltaic devices and photoelectrochemical cells. The semiconductor-liquid interface PEC cell consists of photoactive semiconductor electrode immersed in an electrolyte solution containing redox couple and counter electrode (Chandra Babu K. et al.,1994). The semiconducting materials like CdS, CdSe, ZnS, ZnSe, ZnTe, CdTe , HgSe, etc were used as photoactive electrode to get good conversion efficiency(García-Barrientos A., et al.,2018; Ayeshamariam, A., et al.,2014; Lokhande C.D., et al.1998; Marcus Jones,et al.,2009). Not only in solar cell buffer layer but these chalcogenide semiconductors are popular in optoelectronic applications such as blue green Lasers (Gupta P., et al.,1995), radiation detectors (Burger A., et al.,1984), electroluminescent and biomedical imaging devices (Ajaya K.S,.2011). Zinc Selenide (ZnSe) is a wide band gap material with higher luminescent efficiency and alloying it with Cadmium Selenide provides an opportunity to tune the optical and electronic properties for its use in PEC cells (Ju-Hyun, A.; et al.,2007).

Chalcogenide thin films are deposited by various methods like vacuum evaporation (Kishore V., et al.,2005), molecular beam epitaxy (Schreder B., et al.,2000; Hua-Chiang Wen,et al.,2010), electro deposition (Senthil Kumar .,et al.,2019), SILAR (Gudage Y.,et al.,2010) , arrested precipitation technique (Chaitali S. Bagade, et al.,2001) and Chemical bath deposition method (Kamble1 V. K., et al.,2015;.Pawar,A., .,2013). Considering the simplicity, low costing, and large area deposition utility, we have selected Chemical bath deposition method to synthesize pure ZnSe and CdZnSe thin films. Here we present, (1) the investigations on structural, surface morphological, optical properties of pure ZnSe and $Cd_{0.5}Zn_{0.5}Se$ thin films and (2) the study of these films as photoanode in PEC cell.

II. MATERPIALS AND METHODS

The deposition of pure ZnSe thin films was carried out on thoroughly cleaned glass micro slides and stainless-steel substrate using Chemical Bath deposition method. AR grade Zinc Sulphate ($ZnSO_4$) was used for Zn^{2+} source and Selenium metal powder refluxed with Sodium Sulphite (Na_2SO_3) for 9 hours at 80^0C was used for Se^{2-} source. Triethanolamine (TEA) was used as a complexing agent and pH of the reaction mixture was adjusted to 10.5 by adding the adequate quantity of sodium hydroxide (NaOH). The deposition parameters were optimized to get smooth, uniform and strongly substrate adherent thin films of ZnSe. To get ternary $Cd_{0.5}Zn_{0.5}Se$ thin films Cadmium Sulphate ($CdSO_4$), Zinc Sulphate ($ZnSO_4$) and Sodium Selenosulphate (Na_2SeSO_3) were used in proper stoichiometric ratio. Structural determination and hence microstructural properties analysis of

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Table1. Microstructural Properties of ZnSe and CdZnSe thin films

Thin Film	Lattice Parameter a_1(A.U)	Microstrain (ξ x10^{-3}) line^{-2} m^{-4}	Dislocation Density δX10^{15} lines/m^2	Crystallite size D, (A.U)		Weight%		
				XRD	SEM	Cd%	Zn%	Se%
ZnSe	5.64	3.01	6.66	120	207	0.00	83.64	16.36
$Cd_{0.5}Zn_{0.5}Se$	6.08	2.51	4.61	144	264	34.96	34.81	30.23

these thin films was done by using EMPYREAN X-ray diffractometer with CuKα radiation (λ= 1.5405A^0) in the scanning range of 2Θ (20^0 to 80^o). The surface morphology was studied using JEOL JSM 7600F FEG-SEM operating at an accelerating voltage 0.1v to 30kv. The optical absorption spectra were obtained by using ELICO SL27 UV-Spectrophotometer at room temperature in the wavelength range of 300nm to 900nm.

The ZnSe and $Cd_{0.5}Zn_{0.5}Se$ thin films deposited on clean Stainless-steel substrate were used as photoelectrodes in PEC cell. To investigate the current- voltage and power output characteristics of ZnSe and $Cd_{0.5}Zn_{0.5}Se$ photoelectrodes, they were dipped in the 1M polysulphide electrolyte (The aqueous electrolyte preparation was carried out by adding 1M sulphur (S), 1M sodium sulphide (Na_2S) and 1M sodium hydroxide (NaOH) in succession) in H-shaped glass corvette set with graphite rod as counter electrode.

III. RESULT AND DISCUSSION

A. Structural Properties

Figure 1 shows the XRD pattern of ZnSe and $Cd_{0.5}Zn_{0.5}Se$ thin films deposited on glass substrate. ZnSe shows orientations along (1 1 1), (2 0 0), (2 2 0), (3 1 3) planes and confirms the cubic structure in accordance with JCPD card No. (1463) but Cadmium alloyed CdZnSe thin films shows orientations along (111) ZnSe plane and also (111) cubic and (2 2 0) hexagonal planes of CdSe with much dominant peaks along (1 1 1) cubic orientation. JCPD Card No. (19-191) and (8-459).

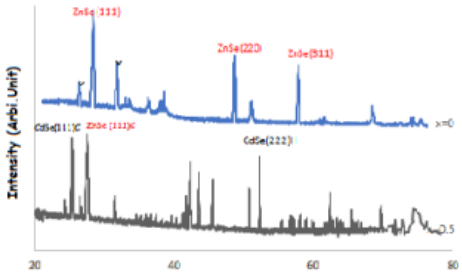

Fig.1 XRD spectra of ZnSe , $Cd_{0.5}Zn_{0.5}Se$ thin films

The lattice parameter d increases from 3.257 A^0 to 3.512 A^0 when Cd was incorporated into ZnSe lattice. The average crystallite size was calculated for the highest intensity peak by Debye - Scherrer's formula shows increase the Cd^{2+} ion, addition of Cd in ZnSe expands the cell uniformly (Hankare P. P, et al.,2006). The microstrain which is disagreement in lattice created during the deposition process and the dislocation density of CdZnSe films was found lower than that of ZnSe films resulting improvement in the stoichiometry which in turn results the volumetric expansion of thin films (Mahalingam, T., et al.,2012). (Table 1)

B. Surface Morphological Properties

Scanning Electron Microscopy is useful technique to understand the surface morphology of the thin films. Fig.2 shows micrographs of ZnSe and $Cd_{0.5}Zn_{0.5}Se$ thin films which describe homogeneous, well adherent films with spherical grains for ZnSe films whereas spherical with slightly elongated grains for $Cd_{0.5}Zn_{0.5}Se$ films. The small, spherical grains are of nearly same diameter of 207nm which represent Cubic phase of ZnSe. The $Cd_{0.5}Zn_{0.5}Se$ films show both cubic and hexagonal phases with increased grain diameter of 264nm. (Kale R.B., et al.,2007). The EDX analysis was done along with SEM for Zn, Se and Cd only. The results give the elemental composition of the thin films which were nearly same as taken in solution and are presented in Table 1.

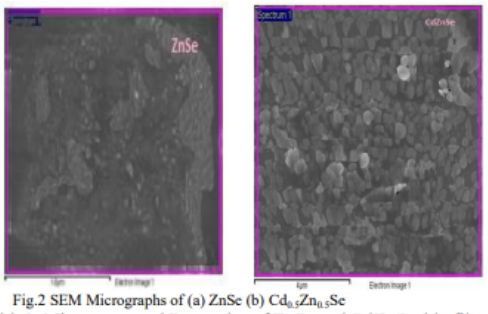

Fig.2 SEM Micrographs of (a) ZnSe (b) $Cd_{0.5}Zn_{0.5}Se$

Table1. Microstructural Properties of ZnSe and CdZnSe thin films

C. Optical Properties

The absorption spectra of ZnSe and $Cd_{0.5}Zn_{0.5}Se$ thin films (Fig.3) indicate that both the films show good absorbance in the visible and infrared region. The spectra also revel long absorption range covering the wavelength 300nm to 990 nm which makes these materials useful for various optical components. In order to estimate the band gap energies, the graphs of $(\alpha h\nu)^2$ Vs photon energy hv were plotted as per Tauc Relation (Fig. 4)

(Tauc, J., et al.,1947). The energy band gap decreases from 2.81eV to 2.27eV because doping of Cd in ZnSe decreases the inter-crystalline spaces among the crystallites. The linear dependence of the absorption edge shows direct type of transition. This direct allowed transition, tuneable band gap of the materials can be best choice for solar photo electrochemical cell applications.

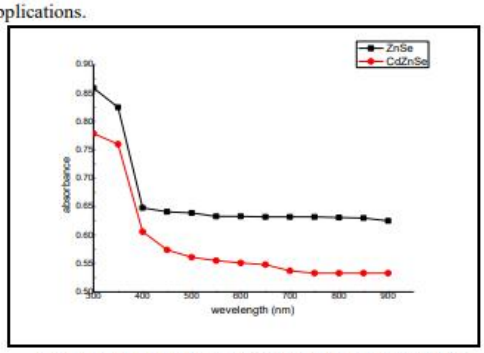

Fig.3 Absorbance curves of ZnSe and $Cd_{0.5}Zn_{0.5}Se$ thin films

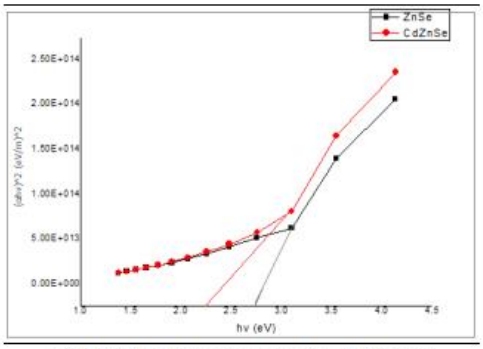

Fig.4 Tauc plots for ZnSe and $Cd_{0.5}Zn_{0.5}Se$ thin films

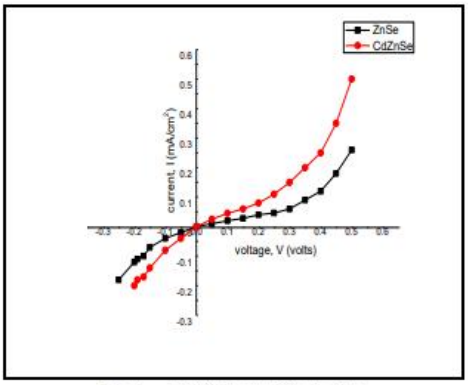

Fig.5 I- V Characteristics in dark

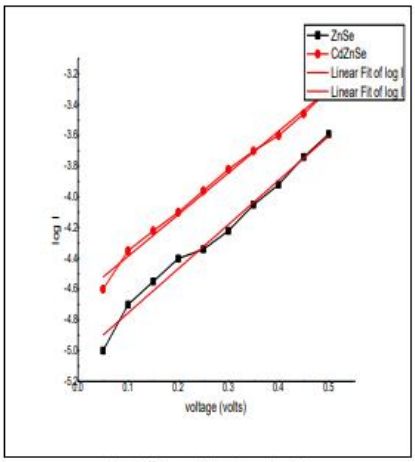

Fig.6 Plots of log I against V

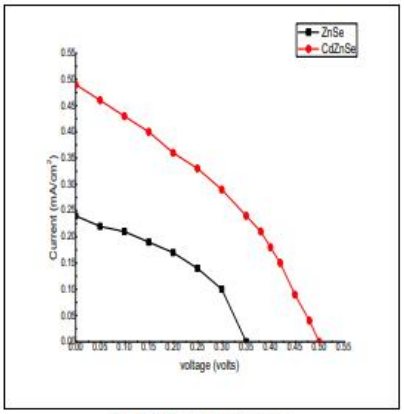

Fig.7 Power output curves

The power output curves were recorded for both the ZnSe and CdZnSe films and are shown in Fig.7. Under constant light illumination, absorption of photons takes place by these semiconducting photoanodes and the electrons in valance band gets excited to conduction band. These electrons will flow to graphite electrode through external circuit and gives open circuit voltage (V_{oc}) and short circuit current (I_{sc}) (Soundararajan D, et al.,2010). The increase in the open circuit voltage of CdZnSe than ZnSe can be understood from the improved grain structure after addition of Cd in ZnSe. The PEC cell performance parameters such as fill factor (FF), efficiency (η), series resistance (R_s) and shunt resistance (R_{sh}) were computed using the following relations from the power output curves and presented in Table 2.

$FF = (V_m \times I_m) / (V_{oc} \times I_{sc}) \times 100\%$

η = Output Power/ Input power

$\eta = ((V_m \times I_m) / P_{in}) \times 100\%$

Table 2. Solar cell parameters of ZnSe and CdZnSe photoanodes in PEC cell

Sample	ZnSe	CdZnSe
n_d	2.87	2.71
R_s (Ω)	1428	671
R_{sh} (kΩ)	3.33	1.53
V_{oc} (volts)	0.35	0.5
I_{sc} (mA/cm^2)	0.24	0.49
V_m (volts)	0.22	0.30
I_m (mA/cm^2)	0.16	0.29
FF	41.9	35.51
η%	0.176	0.435

CONCLUSION

The Chemical bath deposition method was used to form ZnSe and CdZnSe thin films for its use as photoanode in PEC cell. The addition of Cadmium in Zinc Selenide results in improvement of various thin film and photo-electrochemical cell properties. XRD studies shows crystallite size increases from 120 A^0 to 144 A^0 with decrease in dislocation density as 6.66 x 10^{15} lines/cm^2 to 4.61 x 10^{15} lines/cm^2 for these polycrystalline ZnSe to CdZnSe thin films. The FEG-SEM micrographs gives that the films were smooth, homogeneously distributed over the entire glass surface and the crystallinity enhances for CdZnSe films. The UV-Visible spectrophotometer studies indicated the decrease in energy band gap for CdZnSe thin films. The PEC cells fabricated using ZnSe and CdZnSe with Polysulphide electrolyte shows increment in V_{oc} and I_{sc} values for cadmium doped zinc selenide photoanodes results in increased efficiency (0.435%) for $Cd_{0.5}Zn_{0.5}Se$ electrode. Hence, better solar cell output characteristics can be obtained with $Cd_{0.5}Zn_{0.5}Se$ photoanode in PEC cell.

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Selection of Some Plant Species Suitable for Green Belt Expansion in Mumbai Industrial Area - A Baseline to Alleviate Global Air Pollution

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The air quality and global environment is immensely affected due to the industrial as well as urban expansion. The present study aims to identify the natural tolerance of six plant species towards the air pollution, which are growing along the Chembur industrial area of Mumbai. The plant's air pollution tolerance level was identified by evaluating Air Pollution Tolerance Index (APTI) and Anticipated Performance Index (API). The estimation of APTI was done based on the measurement of physico-chemical parameters like pH, ascorbic acid, total chlorophyll content and the relative leaf water content of the fresh leaves of plant species grown along the industrial and non-industrial areas. The higher API values obtained for the *Thespesia populnea* (L.) Sol. *excorrea*, *Polyalthia longifolia* and *Albizia saman* (Jacq.) Merr plant species growing in the industrial zone indicate a good tolerance towards polluted air and hence are suggested for green zone development in the Chembur industrial area. The present work can be extended for the selection of the most air pollution tolerant plant species for the development of green zone along the industrial belt across the world. It will facilitate healthy atmosphere for the nearby population.

Keywords: Relative leaf water, Ascorbic acid, Anticipated performance index, Total chlorophyll, Air pollution tolerance index.

INTRODUCTION

Industrial and urban area expansion deteriorates the air quality and increases the stress on the global environment. The deteriorated air greatly affects the health of plants, animals and humans [1-3]. Air pollution increases the concentration of gases like oxides of sulphur, carbon, nitrogen and also introduces suspended particulate matter into the atmosphere causing environmental degradation [4]. Plants indicate certain symptoms of exposure to air pollutants through respiration, chemical process, membrane disruption, stomata behaviour, catalyst reactions which ultimately results in plant death [5]. A lot of research is going on to find out a simple solution to upgrade global air quality. One of the best, natural and economic ways to improve air quality around the industrial area is green zone expansion.

The Air Pollution Tolerance Index (APTI) and Anticipated Performance Index (API) values can be estimated to analyze the physiological, morphological and biochemical aspects of plants. It helps in the selection of the plant species that are tolerant to air pollution and play a significant part in improving the air quality when used in green belt expansion [6].

In present study, the APTI and API of six plant species were determined in all the three seasons for a duration of two years (April 2017 to March 2019). The outcomes of the current investigation were expected to be useful to identify the sensitive and tolerant plant species contributing to the expansion of the green area in the polluted industrial zone.

EXPERIMENTAL

The present investigation area of Chembur is a north-eastern suburb of Mumbai (19.051°N 72.894°E) which is in the proximity of Trombay area of Mumbai city, India. The suburbs near the investigation area were Ghatkopar, Mahul, Chunabhatti, Deonar, Kurla and Govandi. It was recently ranked first in Mumbai and 80th among the polluted industrial clusters of India with a Comprehensive Environment Pollution Index (CEPI) of 54.67 [7,8]. The average concentration values of SO_2, NO_x, respirable suspended particulate matter (RSPM)

are 5-6 µg m^{-3}, 77-83 µg m^{-3}, 147-148 µg m^{-3}, respectively as per Maharashtra Pollution Control Board report during the study period (April 2017-March 2019) [9].

Plant species: Three replicates of completely developed leaves of six commonly found plant species were collected from the Chembur industrial zone as experimental samples (ES). The samples of the same plant species collected from the botanical garden of Bhavan's College, Andheri (19.073ºN 72.501°E) were used as the controlled samples (CS) as it was away from traffic and industrial areas. Table-1 contains the species, type and native country of the plants chosen for the current study [10].

Collection and analysis of samples: Experimental samples (ES) and controlled samples (CS) collection, as well as analysis, was done for a period of two years at regular intervals during the summer (April), rainy (August) and winter (December) seasons. Cloth and polythene bags were used to collect the ES and CS, which were instantly taken to the testing room. For further analysis, the samples were preserved in the refrigerator. The ES and CS leaves were analyzed for pH, ascorbic acid (AA), relative water content (RWC) and total chlorophyll (TCh).

pH measurement: The pH meter (Equiptronics, EQ 614A) used for measuring the pH of the leaf extract filtrate was standardized using the buffer solution of pH = 4 and pH = 9 [2,11,12].

Ascorbic acid analysis: Many researchers have analyzed ascorbic acid content by spectrophotometric method and very few have analyzed ascorbic acid by HPLC method. HPLC instrumentation method was used to analyze ascorbic acid content. The concentration of ascorbic acid content was investigated using a Shimadzu LC HPLC instrument isocratic system coupled with a diode array detector and flame-photometric detector. The mobile phase was pumped isocratically at a flow rate of 0.7 mL min^{-1} at 20 ºC and Superspher RP-18 (250 × 4.6 mm, 10 µm particle size) was used as a column (λ = 280 nm). A consistent low column temperature helped in stabilizing the ascorbic acid during the analysis. During the study, the field samples were tested for the routine analysis of method blanks, spiked blanks and sample duplicates. The samples were analyzed in duplicate in order to assess the error during sample extraction and the results showed satisfactory precision. Blanks showed the absence of any target compound [13].

Analysis of relative water content (RWC) content: The electronic weighing balance of accuracy of 0.0001 g was used to measure the weight of leaves (Contech, CA 223). The RWC of leaf samples was calculated from the fresh Weight, turgid weight and dry weight values using the eqn. 1 [10,11,14,15]:

$$RWC\ (\%) = \frac{FW - DW}{TW - DW} \times 100 \quad (1)$$

Total chlorophyll (TCh) analysis: The TCh content of the fresh plant leaves was analyzed by the reported method [11,12,16].

Air Pollution Tolerance Index (APTI) determination: The formula mentioned in eqn. 2 was used to determine APTI [1,4,11,12,16].

$$APTI = \frac{AA\ (TCh + pH) + RWC}{10} \quad (2)$$

Statistical analysis: The correlation analysis was carried out by using a univariate Pearson correlation coefficient for individual species to determine the association of the specific parameters related to species, season and place. The statistical analysis of the outcomes was carried out by using the One-way ANOVA method. The significance of correlation for specific parameters was observed for $p < 0.05$ in most of the cases. It indicates that these parameters were associated to the same species. All the statistical computations were achieved using IBM SPSS statistics version 20.

RESULTS AND DISCUSSION

The season-wise biochemical parameter values acquired in the current investigation are presented in Table-2.

As shown in Table-3, a matrix of correlation coefficients was used to observe the positive association of the parameters. A comprehensive study of the data set exhibited that substantial correlations arise among maximum of the parameters with correlation coefficient values persistently greater than 0.5.

Leaf extract pH: It was observed from the analysis data that the pH values of ES were lower whereas higher for CS. The least mean pH value of 5.22 and the highest mean pH value of 6.38 was observed for S2, S1 experimental samples, respectively. A higher pH value (6.93) was observed for S4 sample in winter 2018-19 whereas the lower pH value (5.05) was observed for S2 experimental sample in winter 2017-18. The industrial release of SO_x, NO_x and acid producing contaminants in the air are responsible for lower pH of leaf extract [16]. The sensitivity of the plant to air pollution shows a good relation with the lower pH of the leaf latex [14].

TABLE-1
TYPE AND NATIVE COUNTRY DETAILS OF THE PLANTS STUDIED IN THE PRESENT WORK

Plant species	Plant type	Native country
Polyalthia longifolia (S1)	Tall evergreen tree with alternate and exstipulate leaves	India, Sri Lanka, Pakistan
Prosopis juliflora (SW.) DC. (S2)	Small tree with deciduous leaves	Mexico, South America, Africa, Asia
Calotropis gigantea (L.) Dryand (S3)	Larger Shrub with oval and light green leaves	India, Cambodia, Malaysia, Sri Lanka
Leucaena leucocephala (Lam.) de wit (S4)	Medium fast-growing mimosoid tree with pinnular leaves	Southern Mexico and northern America, India
Albizia saman (Jacq.) Merr. (S5)	Rain tree with evergreen, feathery foliage	Central and South America Invasive to India
Thespesia populnea (L.) Sol. excorrea (S6)	Evergreen shruby tree with alternate simple leaves	Old world tropics, Pacific-island

TABLE-2
SEASON WISE BIOCHEMICAL PARAMETERS VALUES OF EXPERIMENTAL AND CONTROLLED PLANT SPECIES FROM THE STUDY AREA

Parameter	Sample	Experimental samples						Mean	SD (±)	Controlled samples						Mean	SD (±)
		Summer		Rainy		Winter				Summer		Rainy		Winter			
		2017-18	2018-19	2017-18	2018-19	2017-18	2018-19			2017-18	2018-19	2017-18	2018-19	2017-18	2018-19		
pH	S 1	6.11	6.39	6.37	6.74	6.44	6.20	6.38	0.22	6.88	6.91	7.22	7.42	7.64	7.42	7.25	0.30
	S 2	5.39	5.30	5.05	5.12	5.08	5.35	5.22	0.15	7.12	7.06	7.17	7.38	7.02	6.90	7.11	0.16
	S 3	5.93	6.74	5.16	5.29	5.91	6.10	5.86	0.58	6.14	7.16	6.43	6.92	6.83	7.42	6.82	0.47
	S 4	5.35	5.09	5.75	5.90	6.35	6.93	5.90	0.67	6.97	6.61	6.84	7.10	7.41	7.03	6.99	0.27
	S 5	5.82	5.46	5.96	5.18	5.25	6.81	5.75	0.61	6.40	6.68	7.02	7.39	7.39	7.36	7.04	0.42
	S 6	5.62	5.93	5.09	5.35	5.47	6.67	5.69	0.56	7.38	7.22	7.18	7.50	6.92	7.32	7.25	0.20
AA (mg/g)	S 1	9.72	10.22	9.24	9.31	9.91	9.82	9.70	0.37	3.07	3.13	2.82	3.03	2.32	2.62	2.83	0.31
	S 2	10.44	10.47	10.15	10.31	9.80	9.52	10.12	0.38	3.94	2.85	3.09	3.20	3.18	3.22	3.25	0.37
	S 3	10.98	10.44	10.59	10.73	10.84	10.41	10.67	0.23	4.17	4.03	3.94	4.13	3.92	3.73	3.99	0.16
	S 4	10.23	10.27	10.03	10.26	10.73	10.05	10.26	0.25	3.44	3.27	3.06	3.19	3.38	2.67	3.17	0.28
	S 5	10.77	11.18	10.52	10.82	10.01	10.96	10.71	0.41	4.03	3.83	4.17	4.29	3.36	3.59	3.88	0.36
	S 6	10.30	9.85	10.04	10.14	9.50	10.19	10.00	0.29	3.21	3.35	3.28	3.44	2.91	2.83	3.17	0.25
RWC (%)	S 1	86.18	86.55	88.20	91.34	83.39	84.97	86.77	2.76	59.44	60.13	55.50	56.41	54.93	53.12	56.59	2.71
	S 2	76.41	84.64	93.73	95.35	73.56	72.55	82.71	10.12	47.72	63.38	58.26	60.08	58.91	54.59	57.16	5.43
	S 3	85.17	85.58	73.73	71.97	85.62	80.14	80.37	6.20	57.37	78.56	48.30	50.16	63.90	60.35	59.77	10.96
	S 4	91.02	84.17	79.29	81.49	81.35	85.19	83.75	4.14	42.24	46.38	51.68	53.72	51.20	30.90	46.02	8.50
	S 5	79.98	75.06	74.34	76.22	79.19	72.20	76.17	2.97	57.77	49.33	42.29	48.65	48.96	54.03	50.17	5.28
	S 6	89.71	80.91	83.41	85.19	91.05	87.46	86.29	3.85	41.73	67.40	50.63	53.88	73.09	50.28	56.17	11.76
TCh (mg/g)	S 1	6.75	6.66	6.08	6.54	6.03	6.88	6.49	0.36	7.07	7.73	7.24	7.32	7.55	7.46	7.40	0.24
	S 2	5.92	5.77	5.86	6.11	7.18	6.51	6.23	0.54	6.64	6.77	7.15	7.41	8.68	8.29	7.49	0.83
	S 3	6.11	6.72	6.81	6.74	6.65	6.82	6.64	0.27	7.28	8.25	7.51	7.68	8.03	8.26	7.84	0.41
	S 4	6.68	6.74	6.90	6.43	6.36	6.79	6.65	0.21	8.15	7.87	7.94	7.25	8.61	7.97	7.97	0.44
	S 5	7.65	6.95	6.79	6.74	7.02	6.83	7.00	0.34	9.79	8.21	7.47	7.33	9.59	9.16	8.59	1.07
	S 6	6.63	6.41	6.08	6.27	6.03	6.36	6.30	0.22	7.73	7.35	7.93	7.19	7.76	7.46	7.57	0.28
APTI	S 1	21.12	21.99	20.32	21.50	20.70	21.34	21.16	0.59	10.23	10.60	9.63	10.11	9.02	9.21	9.80	0.62
	S 2	19.45	20.05	20.45	21.13	19.37	18.55	19.83	0.91	10.19	10.28	10.25	10.74	10.88	10.35	10.45	0.29
	S 3	21.74	22.61	20.05	20.11	22.18	21.46	21.36	1.06	11.33	12.55	10.32	11.05	12.22	11.88	11.56	0.82
	S 4	21.41	20.57	20.62	20.80	21.77	22.31	21.25	0.71	9.43	9.37	9.69	9.95	10.54	7.10	9.35	1.18
	S 5	22.51	21.38	20.85	20.52	20.20	22.17	21.27	0.92	10.97	10.64	10.27	11.18	10.60	11.33	10.83	0.40
	S 6	21.59	20.25	19.56	20.30	20.03	22.02	20.63	0.96	9.02	11.62	10.02	10.44	11.58	9.21	10.32	1.12

TABLE-3
SEASONAL CORRELATION BETWEEN VARIOUS BIOCHEMICAL PARAMETERS MEASURED FOR VARIOUS PLANT SPECIES FROM AN INDUSTRIAL ZONE

Sample		Summer					Rainy					Winter				
		pH	AA	RWC	TCh	APTI	pH	AA	RWC	TCh	APTI	pH	AA	RWC	TCh	APTI
S1	pH	1.0000					1.0000					1.0000				
	AA	0.8535*	1.0000				0.9054*	1.0000				0.9358*	1.0000			
	RWC	0.7362*	0.9396*	1.0000			0.7853*	0.8941*	1.0000			-0.8795*	-0.8150*	1.0000		
	TCh	-0.7851	-0.8473*	-0.8047*	1.0000		0.8275	0.9759*	0.7995*	1.0000		-0.9470	-0.9603*	0.8647*	1.0000	
	APTI	0.9787*	0.9741*	0.7883*	-0.9142*	1.0000	0.9230*	0.9454*	0.9766*	0.8292*	1.0000	-0.9017*	-0.9759*	0.7773*	0.8886*	1.0000
S2	pH	1.0000					1.0000					1.0000				
	AA	-0.7410*	1.0000				0.8954*	1.0000				-0.8240*	1.0000			
	RWC	-0.9859*	0.9101*	1.0000			0.7964*	0.8284*	1.0000			-0.7601*	0.9109*	1.0000		
	TCh	0.8400*	-0.7692*	-0.8157*	1.0000		0.8840*	0.8429*	0.8537*	1.0000		-0.7827*	0.8961*	0.9292*	1.0000	
	APTI	-0.9597*	0.9749*	0.9403*	-0.7841*	1.0000	0.9156*	0.9453*	0.7781*	0.8905*	1.0000	-0.9109*	0.9358*	0.9205*	0.8232*	1.0000
S3	pH	1.0000					1.0000					1.0000				
	AA	0.7417*	1.0000				0.8471*	1.0000				-0.8764*	1.0000			
	RWC	0.8704*	-0.7540*	1.0000			-0.7257*	-0.8319*	1.0000			-0.9469*	0.9531*	1.0000		
	TCh	0.9968	-0.8532*	0.8850*	1.0000		-0.7582*	-0.8894*	0.7764*	1.0000		0.8350*	-0.9797*	-0.7510*	1.0000	
	APTI	0.8964*	-0.7751*	0.9269*	0.8590*	1.0000	0.8498*	0.9592*	-0.9205*	0.9757*	1.0000	-0.8387*	0.8565*	0.8153*	-0.8956*	1.0000
S4	pH	1.0000					1.0000					1.0000				
	AA	-0.7823*	1.0000				0.8056*	1.0000				-0.9676*	1.0000			
	RWC	0.8727*	-0.8269*	1.0000			0.8897*	0.7378*	1.0000			0.8268*	-0.9245*	1.0000		
	TCh	-0.7670*	0.9262*	-0.9560*	1.0000		-0.7741	-0.9119*	-0.9927*	1.0000		0.8749	-0.7528*	0.7848*	1.0000	
	APTI	0.9409*	-0.9943*	0.8824*	-0.8153*	1.0000	0.9989*	0.8319*	0.8854*	-0.9689*	1.0000	0.9721*	-0.8859*	0.8370*	0.9409*	1.0000
S5	pH	1.0000					1.0000					1.0000				
	AA	-0.9749*	1.0000				-0.7878*	1.0000				0.9150*	1.0000			
	RWC	0.9198*	-0.9198*	1.0000			-0.8313*	0.8991*	1.0000			-0.8797*	-0.7904*	1.0000		
	TCh	0.9368	-0.9153*	0.9924*	1.0000		0.9874	-0.8041*	-0.8041*	1.0000		-0.9687	-0.9740*	-0.8851*	1.0000	
	APTI	0.9143*	-0.9907*	0.9103*	0.8891*	1.0000	0.8295*	-0.8510*	-0.8579*	0.9825*	1.0000	0.9132*	0.7795*	0.8417	-0.9341*	1.0000
S6	pH	1.0000					1.0000					1.0000				
	AA	-0.9079*	1.0000				0.8518*	1.0000				0.9968*	1.0000			
	RWC	-0.8823*	0.8426*	1.0000			-0.9410*	-0.9605*	1.0000			0.8050*	-0.9704*	1.0000		
	TCh	-0.9148	0.9567*	0.7917*	1.0000		0.9436	0.9830*	0.8651*	1.0000		-0.9376	0.9068*	-0.9591*	1.0000	
	APTI	-0.9753*	0.9071*	0.8769*	0.7424*	1.0000	0.8114*	0.8115*	0.9225*	0.7487*	1.0000	0.8491*	0.7740*	-0.8884*	0.9607*	1.0000

*Correlation is significant at the 0.05 level (two tailed). AA = Ascorbic acid, RWC = Relative water content, TCh = Total chlorophyll.

Table-3 data indicates a strong positive correlation of pH with AA values in most of the ES species. The S6 species has shown highest value (r = 0.9968) in the winter season, which indicates that a rise in the pollution resistance mechanism of plants is correlated to an increase in its pH value. A positive correlation was observed for pH and TCh of S3 sample (r = 0.9968) in the summer season, which shows that the increased pH protects the chlorophyll content in the polluted air. This increases the plant life. A strong positive correlation was observed for pH and APTI of the S4 sample (r = 0.9989) in the rainy season, which directs that the tolerance level of a plant increases with an elevated pH value.

Ascorbic acid content: The ascorbic acid content analysis of foliage samples indicates that the values of the industrial area samples were higher than the non-industrial area. The highest mean ascorbic acid value (10.71 mg g^{-1}) was observed for the S5 sample whereas the lowest mean ascorbic acid value (9.70 mg g^{-1}) was observed for the S1 experimental sample. The highest ascorbic acid value was shown by S5 (11.18 mg g^{-1}) in summer 2018-19 and the least value was shown by S1 (9.24 mg g^{-1}) in rainy 2017-18 among the experimental samples. Ascorbic acid is an antioxidant present in plant leaves and an elevation in its value indicates an improvement in the plant's defence towards the air pollution [27,28]. Table-3 shows a strong positive correlation between ascorbic acid and RWC of the S3 sample (r = 0.9531) sample in the winter season that indicates a rise in the water holding capacity of the leaves with a rise in ascorbic acid content. A strong positive correlation observed for ascorbic acid and APTI of S2 (r = 0.9749) in the summer season. It shows a good association of plant's pollution tolerance with a rise of AA content.

Relative water content (RWC): The highest mean RWC percentage was observed for the S1 (86.77%) experimental sample. It was observed that the RWC values of CS were considerably lower than that of ES due to low exposure of CS to air pollutants. The plant species with high relative leaf water content can show good drought tolerance ability even under pollution stress by maintaining its physiological equilibrium [15].

The highest RWC value of 95.35% was observed for the S2 experimental species in the rainy season of 2018-19. The lowest value of 71.97% was observed for the S3 experimental sample in the rainy season of 2018-19. According to Table-3, a strong positive correlation was observed for RWC and TCh of S5 sample (r = 0.9924) in the winter season. It indicates that an increase in the RWC during the winter season helps the plants to maintain chlorophyll content. A strong positive correlation was observed for RWC and APTI of S1 sample (r = 0.9766) in the rainy season, which indicates that the tolerance capacity of plants can increase with an increase in RWC values in any season.

Total chlorophyll (TCh) content: The investigation reveals that the TCh values were higher for CS whereas lower for the ES. The highest TCh value of 7.00 mg g^{-1} was exhibited by the S5 plant species followed by S4, S3, S1 and S6 samples of the polluted areas. The lowest TCh value of 6.23 mg g^{-1} was exhibited by the S2 experimental sample. The difference between the TCh values of experimental and controlled samples was very small. It indicates that the experimental sample could maintain their total chlorophyll content and productivity even in industrial pollution conditions [15].

The current investigation revealed the maximum TCh value of 7.65 mg g^{-1} for the S5 ES in the summer 2017-18 and the minimum value of 5.77 mg g^{-1} was observed for the S2 experimental sample during the summer 2018-19. The values of Table-3 indicate a strong positive correlation for TCh and APTI of S5 sample (r = 0.9825) in the winter season. It shows that a rise in the TCh value can improve the tolerance level of plants in any period.

Air Pollution Tolerance Index (APTI): It was observed that the APTI values of the industrial area samples were higher as compared to the non-industrial area samples (Table-2). It indicates that the air pollution tolerance of the ES was higher than the CS. The highest mean APTI value of 21.35 was observed for the S3 plant species whereas the least mean value of 19.83 was observed for the S2 plant species. The difference between the lowest and the highest mean APTI values was very small. It shows that the air pollution tolerance capacity of all the six plant species was comparatively good. The highest APTI value of 22.61 was exhibited by the S3 sample in the summer 2018-19 while the lowest value of 18.55 was exhibited by the S2 sample in the winter 2018-19. The results revealed that the APTI values of the same plant species showed seasonal variation. The air pollution susceptibility of the plants varies from species to species [19]. The plants exhibiting high APTI values were observed to be tolerant ones while those with lower APTI values were sensitive ones.

Comparison of the outcomes of the present study with the published research data as shown in Table-4, indicates the enhanced pollution tolerance ability of the plant samples from the present study area.

Anticipated performance index (API) and green belt development: The resulting APTI values were combined with some suitable biological and socio-economic characters to evaluate the API values of plants samples. Considering these characters, + or – grade was given to the plants (Table-5). The percentage scoring was considered to allot API grade to plant samples [3,29]. The API determination of six plant species is presented in Table-5.

By relating the API grade with Table-6, it was seen that the S6 sample revealed the best tolerance whereas the S1 and S5 samples showed excellent tolerance to industrial air pollution stress conditions. The S4 sample reported very good tolerance and the S3 sample showed the good tolerance to air pollution. These five plant samples are recommended for the plantations to develop a green area in the industrial region. The S2 species showed poor API grade and hence suggested for economic and aesthetic interest in the industrial region.

Conclusion

Considering the results of the current study, it can be concluded that the APTI values varied remarkably relating to the sample, season and geographical area. Plants possess natural tolerance towards air pollution, which helps them to survive under pollution stress. *Thespesia populnea* (L.) Sol. *excorrea*, *Polyalthia longifolia*, *Albizia saman* (Jacq.) Merr, *Leucaena leucocephala* (Lam.) de wit and *Calotropis gigantea* (L.). Dryand plant species showed higher API grades as well as higher natural air pollution tolerance levels among all industrial zone samples and are suggested for the development of green zone around the industrial area. *Thespesia populnea* (L.) Sol. *excorrea* and *Polyalthia longifolia* are evergreen plants that can be planted on a huge scale for the green area development the year round in the industrial zone. An equivalent study can be conducted globally for the selection of the tolerant plant species. The green zone development at the global level can ensure the presence of healthy atmosphere. It can enhance as well as preserve the beauty of nature for the next generations.

TABLE-4
COMPARISON OF APTI RELATED PARAMETERS REPORTED GLOBALLY

Name of the plant species	Sampling location/ region/country	Year of sampling	pH	AA (mg g^{-1})	TCh (mg g^{-1})	RWC (%)	APTI	Ref.
Polyalthia longifolia (S1)	South west Nigeria	–	5.00	7.20	0.70	81.50	13.20	[17]
	Ghana, Africa	–	5.73-5.92	12.09-13.65	0.58-0-93	84.49-93.86	16.22-18.92	[18]
	Kerala, India	2006-07	5.70	3.65	5.29	86.83	13.77	[19]
	Mumbai	2017-19	6.38	9.70	6.49	86.77	21.16	Present Study
Prosopis juliflora (SW.) DC. (S2)	Southeast Iran	–	5.40	0.30	6.64	55.00	5.80	[20]
	Tamil Nadu, India	2015- 16	7.00	0.36	29.22	79.77	10.00	[21]
	Coimbatore, India	–	6.1	68.6	0.25	80.00	50.00- 51.00	[22]
	Mumbai	2017-19	5.22	10.12	6.23	82.71	19.83	Present Study
Calotropis gigantea (L.) Dryand (S3)	Tamil Nadu, India	2013	9.00	1.95	0.78	99.85	10-12	[23]
	Tamil Nadu, India	2012	7.86	16.90	15.10	90.40	15.10	[24]
	Mumbai	2017-19	5.86	10.67	6.64	80.37	21.36	Present Study
Leucaena leucocephala (Lam.) de wit (S4)	Indonesia	2015	6.90	15.54	4.60	66.54	24.53	[25]
	Tamil Nadu, India	–	6.29	6.29	1.66	72.78	12.28	[14]
	Mumbai	2017-19	5.90	10.26	6.65	83.75	21.25	Present Study
Albizia saman (Jacq.) Merr. (S5)	Tamil Nadu, India	2015-16	6.00	0.12	36.46	67.93	08.12	[21]
	Tamil Nadu, India	–	5.62	5.62	2.83	81.63	12.91	[14]
	Mumbai	2017-19	5.75	10.71	7.00	76.17	21.27	Present Study
Thespesia populnea (L.) Sol. *excorrea* (S6)	Tamilnadu, India	2018-19	5.68	2.09	1.99	85.31	10.14	[26]
	Tamil Nadu, India	–	5.45	6.50	4.75	91.27	15.76	[14]
	Mumbai	2017-2019	5.69	10.00	6.30	86.29	20.63	Present Study

TABLE-5
API CALCULATION OF PLANT SPECIES BY CONSIDERING THEIR BIOLOGICAL, SOCIO-ECONOMIC CHARACTERS AND APTI

Sample No.	Scientific name	APTI	Tree habit	Canopy structure	Tree type	Laminar size	Laminar texture	Laminar hardness	Economic importance	Total plus	Scoring (%)	API grade
S1	*Polyalthia longifolia*	+++++	++	+	+	++	–	–	++	13	81.25	6
S2	*Prosopis juliflora* (SW.) DC.	+++	+	+	+	–	–	–	++	08	50.00	2
S3	*Calotropis gigantea (L.) Dryand*	+++++	–	–	+	+	–	+	++	10	62.50	4
S4	*Leucaena eucocephala (Lam.) de wit*	+++++	++	++	+	–	–	–	++	12	75.00	5
S5	*Albizia saman (Jacq.) Merr*	+++++	++	++	+	+	–	+	++	14	87.50	6
S6	*Thespesia populnea (L.) Sol. excorrea*	++++	++	++	+	++	+	+	++	15	93.75	7

TABLE-6
ASSESSMENT CATEGORY ALLOTMENT CRITERIA OF PLANT SPECIES BASED ON API

Grade	Percentage score	Assessment category
0	Up to 30	Not recommended
1	31-40	Very poor
2	41-50	Poor
3	51-60	Moderate
4	61-70	Good
5	71-80	Very good
6	81-90	Excellent
7	91-100	Best

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interests regarding the publication of this article.

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Structural, morphological and electrical properties of ternary $Cd_xZn_{1-x}Se$ thin films

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Abstract

Pure Zinc Selenide thin films were produced onto the glass micro-slides and stainless-steel substrates as well employing chemical bath deposition method by optimising the preparation and deposition parameters. The concentration of Cadmium (x) in Zinc selenide lattice was changed from 0 to 1. The structural and surface morphological properties of these as deposited thin films were investigated and studied utilising XRD and SEM techniques respectively. These as deposited thin films were poly-crystalline in character and exhibit cubic phase for $0 \le x \le 0.3$ and distinct/mixed phases of cubic and hexagonal wurtzite structures were observed for the $0.4 \le x \le 0.8$ region. Thereafter, again cubic phase seems to be prevailing. The electrical conductivity increased with increase in composition×at the ambient temperature and at higher temperature as well. The thermoelectric power measurements revealed that these semiconducting thin films exhibit 'n' type conductivity.

Introduction

The chalcogenide thin films are of major importance for the construction of solar cells, photoconductors, photodiodes, sensors etc. Amongst the range of chalcogenides, Cadmium Selenide and Zinc Selenide belonging to II – VI groups are believed to be the promising materials because of their increased recombination efficiency, greatest absorption coefficient and strong photosensitive qualities [1], [2], [3], [4], [5], [6]. The band gap modulation of $Cd_xZn_{1-x}Se$ ternary semiconductors may be obtained from 2.72eV (ZnSe) to 1.74eV (CdSe) by composition change which aids the creation of opto-electronic devices [7], [8], [9]. Usually, the structural alterations exist in thin layers, whereas the bulk ZnSe and CdSe are in Cubic, Hexagonal wurtzite in structure [10], [11]. The doping of Zn^{2+} in CdSe affords variable bandgap, intriguing size dependant characteristics, increased photocorosion and excellent stability thin films [12]. Various approaches are utilised to synthesis CdZnSe thin films such as thermal evaporation, electron beam evaporation, electrodeposition, electrochemical quartz crystal microgravimetry and volumetry [8], sequential ionic layer adsorption and reaction, magnetron sputtering, Chemical bath deposition etc [13], [14], [15], [16], [17]. Among all these approaches, Chemical Bath Deposition (CBD) technique, has advantages of simplicity and low cost as it does not require high vacuum system and other expensive, sophisticated instrumentation. In a single run, a large number of substrates can be coated using this CBD method. The deposition can be controlled by several preparative

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simplicity and low cost as it does not require high vacuum system and other expensive, sophisticated instrumentation. In a single run, a large number of substrates can be coated using this CBD method. The deposition can be controlled by several preparative parameters such as pH of reaction mixture, temperature and time of deposition to obtain controlled orientation and improved grain structure [18], [19], [20].

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The Cadmium doped Zinc selenide thin films were deposited on ultra clean micro glass slides and stainless steel substrate using CBD technique by adjusting the [21].

This work is directed at the investigation of the effect of composition parameter, x on the structural deformations, surface morphology of ternary Cadmium Zinc Selenide thin films.

The attempts are also made to explore and assess the electrical and thermal transport properties of these as deposited thin films.

Section snippets

Experimental details

The samples of $Cd_xZn_{1-x}Se$ thin films are prepared by utilising AR grade Cadmium Sulphate ($CdSO_4$), Zinc Sulphate ($ZnSO_4$), Sodium Sulphite (Na_2SO_3), elemental selenium powder (99 percent), triethanolamine (TEA) [$N(CH_2CH_2OH)_3$] and liquid ammonia (NH_3) using Chemical bath deposition technique. The composition parameter, x was changed from x=0 to 1 to obtain films on extremely clean micro glass slides and stainless-steel substrates. The hue of these as deposited thin films altered from pale white...

Structural analysis

The structural characterisation is very significant in acquiring crystallographic information and explaining the electrical transport features of these $Cd_xZn_{1-x}Se$ thin

Structural analysis

The structural characterisation is very significant in acquiring crystallographic information and explaining the electrical transport features of these $Cd_xZn_{1-x}Se$ thin films. The XRD patterns recorded for these thin films of varied compositions onto the glass substrate are presented in Fig. 1. The emergence of strong peaks in XRD diffractograms suggested that all the films were polycrystalline in nature

[22]. Many researchers doped Zn in CdSe to construct CdZnSe system by different methods and...

Conclusions

The effect of incorporation of cadmium concentration into the host ZnSe lattice ($Cd_xZn_{1-x}Se$ thin films) has been explored, with special attention on their structural, surface morphological and electrical- thermal transport properties. The XRD and SEM tests showed that these thin films were polycrystalline in nature and the increase in cadmium concentration improved the crystallinity and surface characteristics. The rise in electrical conductivity and thermo-electric power with increase in...

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper....

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The Land

Bhoomi by Milind Bokil in Marathi
Translated by SHUBHADA DESHPANDE

Translator's Note

The original story in Marathi, *Bhoomi,* is by Milind Bokil, a renowned author in Marathi whose literary works are enriched by a unique realistic dimension that is a result of his active involvement in social work as an activist. The present story is thus an appealing account of how a Christian missionary from Germany, initially assigned the role of a teacher in a small village of Maharashtra devotes himself to a social cause and how the same determination to help the deprived section in the village leads to his expulsion thus making him realize the naked truth of being different from those whom he thought to be his own extended family across the national borders.

The translator has always found story an easy genre to be translated, possibly due to the prose narrative, as compared to poetry. However, untranslatability kept hovering around while translating *Bhoomi* from Marathi to English as the context is rich with culture-specific features such as dialectal expressions. Bassnett (1980) mentions that it is not possible to get a text exactly translated into another language as there are several factors involved like 'different cultures, societies and linguistic systems among others'.(Xavier: 1997) Though the translator belongs to the same linguistic background and can easily understand the dialectal version of the expressions in Marathi, she could understand the richness of such rustic expressions in a literary text but found it very difficult to transfer the genuine ethnic essence of the dialectal expressions. For example, the following Marathi extract from the original story

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"त्ये तर काई न्हाई. दुसऱ्या दिवशी फादरनी सोता कपडे काढून इहीर खणायला सुरवात केली. आपण अजून हथरूणातनं उठत बी न्हाई तवा हातभर माती खोदली होती. लई लाजवलं फादर तुमी आमाला "

Untranslatability thus couldn't be overcome successfully and the translator had to give in and translate the dialectal expressions in Marathi into the standard English version.

According to Abdullatief (2020), omission can play as a translation strategy to resolve a translation problem. He cites Dimitriu (2004, 165) who suggests omission as a helpful strategy for translators in order to adjust the translated text 'linguistically, pragmatically, culturally or ideologically' for the audiences/ readership targeted. He further discusses omission as a translation error but finally cites Baker (2000) to conclude that it performs the role of a strategy to 'deal with non-equivalence problems.'

As the present story is set in rural India, except the protagonist and two more characters, all other characters belong to rural background. Though some might be literate, they all are deprived of education due to their social status. Some of them, naturally, speak abusive language, though apologize for it.

"बघ ए हणमंत्या, बघ," बजाबा विजयाने ओरडला "आयघाल्या, तुला मी सांगत व्हतो ते पटत नव्हतं ना?"

Untranslatability of the abusive words made the translator simply use the expression 'abusive words' instead of translating the exact words. However, the author of the original story suggested some expressions in English as the translation of these words. Thawabteh (2014) looks at borrowing as a boost to 'rapid and ubiquitous intercultural exchange'. Using loan words from the SL is thus a commonly accepted strategy in translation.

In terms of the dialectal version of Marathi in the story, the translator, in spite of being aware of the beauty of the version,

had no other option than translating the expressions into simple, more general words, as Baker (1992) mentions it as 'one of the commonly practised strategies' in translation.

"वाजंत्रीचा मोसम" was a term in rural and geographical dialect of Marathi. The translator had to use the word 'band season' to make the readers understand the concept. The underprivileged classes played the band as a part of marriage processions in order to earn additional income.

This is, as Owji (2013) mentions, the 'semantic void", inability to find semantically similar word in the TL. The dialectal version spoken by the villagers of Sawarde in the story is a specific feature of Marathi language thus making it difficult for the translator to transfer the exact layer of meaning and beauty. Venuti (1996) has mentioned language as a 'collective force, an assemblage of forms' constituting a 'semiotic regime' and discusses an interesting intertwining of the standard dialect that in fact dominates but at the same time is 'subject to constant variation from regional or group dialects..'.

The word *Harijan* (meaning the sons of God referring to the underprivileged classes of society) was kept the same way in English as the word has been added to some English dictionaries. As regards the use of loan word here in the TL, the translator agrees with Coulthard (1992) who has opined that the translator has the image of an 'ideal reader' in mind who has 'knowledge of certain facts, experiences, opinions, preferences and linguistic competence'. Coulthard further states that it is on the basis of this image that the translator takes the decisions relating to 'content, expressions, sequencing and rhetorical devices.'

Similarly, the story includes some expressions in English by the protagonist as well as other two educated characters, spelt in Devanagari script.

"आय एम टेकिंग द नाईट ट्रेन", "आय एम शुअर द सोसायटी हॅज प्लॅन्ड समथिंग फॉर यू"

The translator had nothing else to do than scripting the expressions in English.

The story is in third person narrative mentioning the protagonist as Father throughout the text. The translator has spelt the word with the initial in upper case throughout the story as she wanted to specify the difference between the words 'father' as a noun and 'Father' as a proper noun categorically referring to the priest. One can thus identify the limitations of the script, i.e., the original story being in Marathi which does not include similar noun; however, the same word signifies a noun too in the target language.

Khozan (1993), suggests that a translator is helped by the 'best approximations' to maintain the 'atmosphere' which in New Criticism refers to the emotional mood prevailed in the story. The present story includes formally reduced expressions like "In the inanimate, cold climate there." "In an unnatural quietness." as translated in English. The translator found it necessary to translate those reduced formal structures verbatim as it could transfer the exact mood of the context to the target language.

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The Land

Father had a final overview of the packed baggage. There was nothing much to be packed, in fact. Two big suitcases and a handbag. The government had given ample time to prepare. Ten days. Packing two bags within that period was not at all difficult. He had rather decided to leave behind many things. He had bought his own clothes when he came here. It would be the same while leaving.

The villagers from Sawarde had said they would be coming in the afternoon. To bid him farewell before his departure. Father had been to Sawarde some five-six days ago but all of them were not present so couldn't meet them. Those whom he could meet had yet to overcome the blow of Father's leaving the country. Then they said that they would all come and meet him in the school to say farewell.

Father stood near the window. Vacations were on. It was all quiet in the school premises. The two-storeyed, yellow school building formed a right angle with the place where he used to stay. There was an open ground in between. It had almost reached the road. Tamarind and mango trees surrounded the ground. The place that otherwise used to reverberate with children's loud chatter was now occupied by a few squirrels scurrying around on the ground.

Father then began waiting for the people. In fact, he was against any such farewell. But Sonawanes were determined. Father wouldn't have paid heed to anyone else's requests. But he was not willing to displease the people from Sawarde. All those Harijans occupied a tender space in his mind.

Finding no one approaching his house, Father turned inside. Important documents were stacked on the table. The one at the top was from the Government of India. He kept staring at that thick, brown envelope for some moments. Then he sat in the chair and opened the letter. The content was clear. Written in a civil but firm language. Crystal clear. No ambiguity! Leave the country in ten days.

Father kept the letter inside the envelope again. He was alarmed when he had received it a week ago. In fact, he was cautioned by some of his acquaintances against some such happening. It was when he was to get his visa renewed. But he had not taken it seriously. He was hopeful to get the visa renewed as usual. But instead, he received this letter asking him to leave the country within ten days.

Father sighed keeping the letter aside. He was not at all willing to leave. He had not applied for citizenship but had never even imagined of being forced to leave this country some time. It was almost twenty years since he had arrived here from Germany. He had spent the initial fourteen years in the seminary. He used to teach the students learning the religion there. But he was weary of that dull routine. The seminary was situated in a big city. After some time, he developed a feeling of being inactive. All days used to be stereotyped. A strange stagnancy had made his life monotonous. A life- closed, lonely and ascetic. He then came to the school here. A district place that could neither be exactly called a city nor a village.

In the beginning, he liked the work in school. He used to speak broken Marathi initially but improved it as he stayed there and

started speaking it clearly. The school had a hostel connected to it. The Mission had its hospital at some distance. Taking stalk of the functioning of the school for around three to four years, he widened its scope. The number of children in the boarding increased too. He started realizing the true meaning of the term 'rural' as he got acquainted with those children. He used to advise the children to be regular in school and to scold those who were irregular. He used to ask for an explanation from the parents in case of those with poor academic progress. But when he started visiting the children's homes for this reason, he got to know that the main problems were different. Those were really the problems associated with poverty and misery. First of all, those issues needed to be addressed to make an improvement. Superficial solutions could be of no use.

He lost his attention in the school after he realized this. He started wandering around that whole region then. Sometimes on the bicycle or he even used to walk sometimes. Used to meet people. See their lands. See the crops. Used to observe their hordes migrating to faraway places for harvesting sugarcane every year. He realized that the whole region depended on the whims of monsoon. And the rains were unpredictable and. sporadic. Always less than required. Most of the land was rainfed and therefore always drought affected. They used to sow the seeds whenever possible after the first monsoon and then kept waiting for the rains. They could harvest something only if it rained. Many times, it turned out to be only fodder. If it didn't rain, they would lock the houses and wander around in search of work. When Father realized the importance of water for farming, he started helping them in digging wells. Many a time, he used to arrange for the loans from the banks for them. Sometimes, from the funds of the institute. Initially he used to help individual farmers and then

groups. Then he began selecting the most deprived ones to help.

He was not able to understand exactly what was wrong with his work that made him suspect in the eyes of the government. He could understand that his way of work was hurting the interests of some other leaders and the big shots in the villages. The place like Sawarde had developed into an almost warlike situation. Anantrao from there was a big leader and was not happy with what Father was doing. People like him used to defame him so that he would leave the place. And they used their usual technique to defame him. But it was all false as one could judge. All crystal clear….and yet the government had taken this decision! Father was very disturbed and shocked to the core by all this.

He tried to get the decision cancelled. He requested some known influential people to work in his favour. He sent a telegram to the Archbishop too. But he was told that nothing could be done in such situations. There was very little time. He was very disappointed to know about it. Didn't even come out of his room for two days. He had been passionate about his work. Had made new plans. It all disappeared in just one moment.

He then started packing up all his belongings. Visited as many villages and met as many people as possible. He wrote letters to those whom he couldn't meet. The bus was scheduled for night. People from Sawarde had yet to come. It would all be over once they came and left.

He got up to see as he heard sound of people talking to each other in the premises. But it was the school gardener talking to some labourers. Talking amongst themselves, those people went away and again there was silence in the premises. Father looked at his watch. It was too early for Sonawane and people to come. Once they left, he would meet the bishop in the

evening. Father had received a message that he was staying in the mission hospital.

Father had a look around the room. The things in the wooden shelf on the wall had yet to be taken care of. Most of those things would be left behind. Father opened the closed shelf. Many books were there which he had planned to donate to the school. An atlas, that too was to be donated. Pens, pencils and many such trivial things were there. There was a non-functioning watch. Bottles of medicine. Some files. Old albums of photographs and a pile of his personal letters below the album.

Father lightly picked up the pile of letters. All those were the letters from his brother- Hans. The last letter was dated six years back. He had been in a sanatorium for almost sixteen years after the war, suffering from asthma. No one else from Father's family had survived. Hans was the last. He had passed away in the same sanatorium six years ago. Since then, he had stopped getting letters. This pile of letters was pushed to the rear side somewhere.

Father dusted those letters and sat in the chair with those letters. Those were all from his brother Hans. All letters were in a specific type of envelope. The content inside was mostly the same. Hans' health used to have changes like the weather. The letters mostly talked about his health. Followed by trivial complaints. Stereotypical activities in the sanatorium. Anyone could tell the content without opening any of the letters. Father used to write letters to him regularly. Used to inform him about the happenings in India. He had tried to fill up the vacuum in his brother's lonely life. Used to wait for his letter. Six years ago, that link was broken.

Father removed one of the letters from the pile and started reading. After the description of his disease, Hans had revived old memories. He could not join the war due to his ill health.

He used to work in the post office far away from home. Father had joined the army. Everything was destroyed by the time war came to an end. His sister and father passed away in the last bomb attack. Mother was left behind all alone. She lost her mental balance when the enemy forces intruded. Father was held captive as a prisoner of war. Hans was absconding. She committed suicide by jumping off the third floor. Hans had recollected it all. Their childhood before the war, their village, school, sister, parents. Other friends and relatives and everything in their earlier life.

Though it all had happened a long ago, Father experienced a deep surge of emotions in the heart. Hans was tall with a smiling face. But the asthma had wiped off that smile. Father had visited him once but he was beyond recognition. With a grown beard. Ribs were moving. Younger to Father, he was looking many years older. He was panting. Not able to speak anything. When Father met him, he sat there holding Father's hand in his own for a long time.

But at least he was alive for many years. Daddy and Ana had died before anyone could gather wits. Father remembered; it was mandatory to join the army. One could smell the war in the air, He had joined when the war began. France, Austria, Russia. Initially, everywhere they were all frenzied by the victory and later ridiculed by the whole world. Disdain for being a prisoner. Coming home he could see nothing but heaps of debris and ashes.

Father remembered: He couldn't meet his parents and the sister but he could at least know what had happened to them. But he never came to know what happened to Norma. She was there when Father had returned home a couple of times during the war. She had taken up a nurse's job. But she could not be traced after he went to Russia. Since then, he could never see again the tall, slim figure with silky golden hair that she

possessed. No one could tell him anything about it. He tried hard to search for her whenever possible but his efforts were in vain. He then consoled himself that she must have lost her life in war somewhere. But the qualm remained forever.

Father thought to himself……. had there been no war, perhaps the things would have happened differently. That doesn't mean I had not become a priest because that was decided long back. But the loneliness resulting from the loss of the whole family wouldn't have been my fate. There would be Hans, Ana, their children. Other friends would be there. Norma would be there too. Even far from the land, there would be a supportive feeling of having one's own people. There would be a weak string of Norma's love. But the war that took place, took the vitality and vigour out from life drying it to the extent of being desolate. The youth is all a waste, full of ugly features and scratches. Neither could I realize how the hands got hold of the gun nor am I aware of how I started using it. Went on killing everyone in front of me. I enjoyed riding tanks in their devastated villages as and when we won and was lashed by the same people when imprisoned. When I returned, the hands were full of blood and the mind was full of willingness to become a priest, realization of a new sin and a helplessness of having lost everything and everyone.

Father thought it was better that he came to India. Life was channelized into a new direction. There was so much to be done here. And it could give satisfaction too. After Hans passed away, there was no one left in the family. Life was devoted to the church. He was happy with the thought of continuing his work in India. Till the body lost its strength. But now that is also not possible.

With his eyes closed, he quietly leaned back in the chair.

Hearing the noise of people in the premises, he got up and came to the window. It was Sonawanes. With loud chats, they

approached his house. Ten-twelve of them. Jagnya, Kundlik and Mukinda were also there. Father waved his hand from the window and indicated the way towards his room. He opened the door and stood there. All of them suddenly stopped talking as they were close to his house.

"Come, friends," Father said, "Come in".

Removing the footwear near the door, all of them came in. All were quiet as they entered. Jagnya, Kundlik and a couple of others were regular visitors. Others hesitated a little to sit and kept observing the pictures on the wall.

"Is the dog tied?" asked Jagnya. "It would be difficult for us otherwise."

"Yes. He is tied throughout the day. So, nothing to worry during the day."

"Is there a dog here?" one of them asked.

"Yes… a big dog it is," said Jagnya.

"It was not letting us step inside the gate when we had first visited Father. We had to call him from outside."

"Please sit down, friends. Why are you standing?" said Father.

"Yes, we will," replied Bajaba, "we were looking at the pictures on the wall. Father, is it from your country?"

"Yes, from Germany."

"Would you be going there, now?"

"Yes. To Germany," replied Father, "Where else to go?"

"It must be very far, must be an air travel, if I am not wrong! How long does it take?"

"ummmm…. takes one whole day," Father replied thoughtfully, "till I reach home."

"Oh…. really! Still better as you would take a flight. How long should it take by train if one plans to?" asked Bajaba.

"Long time. But there is no railway available."

"It should be. Don't you think? What if anyone wishes to travel by train?"

"Keep quiet. Don't try to be over smart." Someone among them interrupted him and said, "Be the Prime Minister and then bring whatever improvements you like. How childish to say there should be railways!"

All of them laughed. Father occupied his seat after they all sat. Initially, Jagnya and Kundlik were standing but as there was no space left anywhere, they sat on the bed beside Father. It was silence for some time. Some of them began gulping water from the jug kept on the stool.

"I remember the day when you first visited us," said Kundlik. "Father from Kardile brought you here. He was saying we should dig a well to make provision for our drinking water. But you insisted on irrigating agriculture. That Father was not ready to accept your proposal. Do you remember? What a long discussion it was!"

Father smiled. He remembered. The parish priest had been unable to apprehend this subject. He was of the opinion that Sonawanes being Harijans, were prohibited to get water from the village well so a new well should be dug up. I was exasperated at the sight of what Sonawanes were facing. It was a colony on the outskirts of the village. Their houses were similar to those of the nomads. The roofs covered with wedges. No separate drainage system. Dogs resting therein. Half-clad children wandering bare feet. Many of them used to work as labourers in others' farms. They used to toil hard day and night except for some hours of sleep. Accompanied by

families. Their own lands were rainfed. Unable to grow any greens.

Father could recollect… while scouting a place for the well, he had realized that though dry, their lands were beside a brook. It could have good water levels below. He had dreamt of improving their farming with the help of a pump and pipeline thus irrigating their whole land. To make them independent and to save their hardships of running around in search of labour. Mere provision for drinking water, as he had rightly thought, was not going to be the solution to their problem.

"It was really helpful to get the land irrigated, wasn't it?" asked Father. "Water has changed your life."

"Yes, Father, you're absolutely correct," Sukdev, the oldest among them, replied, "We are grateful to you. I still remember our plight. Five years back, we used to toil hard and do all petty jobs begging for our daily bread in return. We used to be chased by dogs while asking for bread. Small children used to throw stones. What an inhuman life it was! As if we were living for the sake of living and there was no other motive at all!"

Everyone fell silent. They all fixed their vision to the ground. Avoiding each other's faces. Jagnya cleared his throat and said, "I still remember the time when you had scolded us." Everyone was curious to hear as he reset himself sitting comfortably on the bed and continued, "You initiated the work of digging the well but we did not contribute anything. Father, it made you angry."

"True," said Bajaba. "But it was band season. It is the time when we can earn something. It really helps, doesn't it?"

"I remember it, too," said Kundlik. "Father convened a meeting and told us that the well belonged to us. We would need to work laboriously. No one else could help us."

"That was not enough. The next day Father took off his white clothes and started digging the well. We woke up to see that he had dug up almost a hand deep. Father, you made us feel ashamed of ourselves."

Father smiled affectionately. But he remembered how he had lost his temper then. He was baffled to see their ignorance and carelessness. According to him, digging the well was in fact an issue at the heart of their life. But these people were happy with the petty, wrong jobs that could not give them any dignity either….in spite of being aware that it is socially not acceptable? How could they accept the job only for the sake of some drops of liquor? He had sounded very rude and stern then. He had called them 'silly' and 'stupid'. They were trying to convince that those two months was the only period to earn something meaningful. But he had not heeded to their pleas. He had stayed there overnight and couldn't sleep the whole night. He had then decided to start digging the well himself. And had started before anyone else had got up.

"I remember it too," Hanmanta, the bearded man said, "I went to the plain in the morning and to my great surprise, Father was digging it all alone. Bare clothed. Body sweating profusely and dropping it on the ground."

"Yes, yes," Sukdev said, waving head, "Father, you have sweated for us. You left no stone unturned for us."

"Now let us keep that topic aside. Did you get the chilly saplings?" Father interrupted him.

"Yes, Father," said Jagnya. "We got it in the neighbouring village. We finished planting the saplings and came here."

"Good we are on this topic now," said Bajaba, "Father, could you please help me with my doubt? Are we supposed to spray half a dose of fertilizer on the chilly one month after planting it or not?"

"You are correct," Father said. "First half before plantation and the remaining to be spread after a month."

"Listen to what he says, Hanmantya," Bajaba said loudly in a triumphant voice. "You swine! You didn't agree when I told you the same."

"Bajaba, behave your tongue," Jagnya interrupted him, "Try to mind where you're!"

"Pardon me, Father," said Bajaba, slapping himself, "I know it's a bad habit but this Hanmantya was acting smart."

"But Father," intervened Kundlik, "co-operative societies do not approve loan for vegetable farming. It would have really helped if they gave it. We need to spend from our own pocket to buy a bag of fertilizers."

Father kept quiet. He thought Sonavanes had lied to him in this regard though he never expressed it to them. He remembered the day when the water lifting had started and the topic of fertilizers and seeds was discussed. He had offered the seed of groundnut and asked them to get the fertilizers from the credit society. They all had said, "Society belongs to all big shots. No one is going to entertain us there. So better you provide us with everything." Father had trusted in what they said and had given them everything. Later he met the secretary of the society coincidentally who revealed that a loan was given to all of them. He offered to show the ledgers as proof and mentioned that it was time by then to collect the dues. Father didn't try to verify it with them but was restless for some of the days after that incident. He was annoyed by this kind of ingratitude towards someone extending a helping hand. He was aware of the poverty and the deprivation causing helplessness. But it was very difficult for him to digest the fact that they lied to him.

Father remembered how disappointed he had been after that incident. As if he had lost faith in humankind. He had a strong feeling of not doing any favour to anyone. But time made him realize how it was exactly what people called experience and life. He understood the importance of being tolerant towards all such kinds of people. Initially, he had decided not to give them the seed of wheat but this realization made him considerate of them and he had changed his decision.

Mukinda was sitting quietly in a corner as others were talking. His head was down for a long time. He was busy removing the tassels from the mattress by one hand and with the other one on his cheek. Father happened to look at him.

"Hey, Mukinda, what happened? Why are you quiet?" he asked.

Mukinda felt ashamed as he laughed and looked down deeper. He was around forty years of age but his lean body structure made him look younger. He scratched the beard and started playing with the mattress again.

"Hope you don't drink now, do you?" asked Father.

Mukinda shook head looking down. "I don't drink now," he said. "Kicked the habit."

"How is Anyaba?"

"He was supposed to join us, Father," said Bajaba before Mukinda could say anything, "but there was a death in his relation. So, he got stuck there."

"Has he stopped drinking or not?" asked Father.

"He says he has stopped but not completely," told Jagnya. "He gets a kick at times."

"In fact, our Anyaba is very clever," said Kundlik. "He has stayed in Mumbai. He thinks very smartly. But this habit of

drinking has spoilt him. Additionally, the village is full of such hooligans. They make him dance on their tunes. A mere quarter of liquor can rob him of everything. Except this, he is an excellent man one could find on the earth."

Father could visualize the short and fat figure of Anyaba. His face often looked growling. Eyes often reddened and a constant stink of liquor around his body. He wondered how men display a variety of dispositions. Had Anyaba utilized his wisdom for his clan, Sonawanes would have benefited a lot. But he lacked that understanding. There were two parties in the village and people from both the parties used Anyaba to fight against each other. A bottle of liquor could make him stand in front of anyone's house and hurl abuses on him. At times, it could even lead him to fights. Mukinda was his associate.

Father remembered. Anyaba had started complaining when they decided to lift the water. The rest of the villagers were against the Harijans. They instigated Anyaba. Initially they said, "You will not get the land beside the brook." So, Father managed to get permission from the higher authorities. Then they wanted to be a part of the scheme. But that too was strongly rejected by Father. So they provoked Anyaba and started troubling. Mukinda and Anyaba used to drink and attend and disrupt the meetings whatever way they wished. Once he had hit Jagnya in the head with a mattock.

Father recalled the whole long history. A history full of maddening quarrels and skirmishes. In spite of being poor and exploited by the landlords, Sonawanes were not organized and united. Even after consistent mediation, they used to fight and quarrel among themselves. This used to be at its peak especially at the time of distribution of water. Everyone used to break the bunds and channelize the water to their own land as soon as it overflowed. It was beyond their understanding that the water belonged to all of them and that an equal

distribution was the only way to sustain the lift scheme. Father used to spend most of his time explaining to them this simple logic.

But this was not the only problem. Anantrao in the village was another trouble... He was the Chairman of the Zilla Parishad and his land was adjacent to their land. He owned the whole village. No one in the village disobeyed him. As Sonavanes got good water levels below the land beside the brook, he also started digging a well there. At a distance of merely fifteen feet and beside the brook. He deliberately signed a contract for this work with Anyaba and some of the Sonawanes started working there as labourers too.

Father's anger had known no bounds when he came to know about it. It was beyond his capacity to understand the ignorance and foolishness of Sonawanes. He was aware of Anantrao being a troubling hurdle but couldn't understand why Sonawanes were digging their own grave by digging that well. He approached the well shouting at the people. At the same time, coincidentally, Anyaba came there with some other labourers. Father called him close and asked, "What kind of drama is going on here?" He replied arrogantly, "Which drama? I am digging the well." Father had slapped him very hard for this.

"We were not in our senses at that time," said Hanmantya, scratching his head. "We used to behave madly."

"Why madness?" said Jagnya. "You didn't realize whom to treat dearly and who was your enemy. I was not there in the village at the time else would have told you better."

"But we were helpless!" said Bajaba. "Anantrao managed to get the ownership of brookside land. There was proof. Who can challenge the records?"

"Record was brought later," said Jagnya. "Better you don't mention the records. He did not own land there originally."

"He might not. But my dear friend, he managed to get it done on paper. Didn't he? Wasn't his name written on the paper? Father, what do you feel?"

Father merely nodded head. He had openly started a mission against Anantrao with the help of Sonawanes. He sent letters to Tehsildar, Deputy Collector and also to the minister. He also got it published in the newspapers. But legally they were unable to restrict Anantrao from digging a well there. Additionally, he enjoyed a good social status. People used to get scared of his reputation. He arranged to get all the documents from the Tehsil office proving his ownership on the land.

Father remembered all those days. He was a lone warrior fighting there. But there was no chance of any authority taking note of it. Anantrao was so dominating that Sonawanes were scared to attend the meetings too. In addition to this, he started spreading a word against Father and continued digging the well.

"But collector sir was good, wasn't he?" said Hanmantya. "He was quite understanding."

"Certainly. He was a great man. He used to speak our language, though broken. The way he crossed Anantrao was really amazing."

"But how could he alone do anything?" said Bajaba. "All other bastards were there to interrupt."

Someone shooed Bajaba again. Realizing his own mistake, he shut up. The collector was really a good person. Father remembered how finally he had approached the collector as no one else was responding to him. Initially, he had doubted

Father's intention. But once listened to the whole story and said, "I am supposed to visit that area. I will personally go and enquire."

Unfortunately, Father had to leave for Retreat at the same time. He felt that it was his mistake. He should have postponed the dates and should have remained present when the collector had visited Sawarde. When he visited, he saw exactly the opposite of what father had told him. Anantrao was present. Sonawanes admitted in front of the collector that they had no trouble in Anantrao digging the well. They registered no objection. They gave a written statement. Waiving the statement before Father's face, the collector said, "See…..what you told was so different from what your people said."

Father remembered his own helplessness at that time. Hearing him, Father sat helplessly in the collector's office for some time. As he was unable to articulate any words. The collector broke the silence after some time as he suggested that people must have been scared and prompted to say so. They were scared of Anantrao. One could clearly infer the weakness of Sonawanes. Anantrao had taken an undue advantage of Father's absence there and had forced them all to write it.

Recalling that incident, Father said to the people, "You should not have given that written statement. It aggravated the issue further. A little more strength and resoluteness would have resolved the whole problem. Not only did you all let me down but also incurred a big loss for yourselves."

They all looked down again. There was complete silence for some time. Sukdev cleaned his throat, kept the turban on his lap and said in a little stretched voice, "How to tell you, Father? It is not so easy to speak out everything. One day prior to the collector's visit, Anantrao and his men visited all our houses. Warning us. He told us that in case we had said anything against him, he would end our lives in a brutal way.

Would parade our women naked on the streets... Would destroy everything. How were we supposed to face him in such a terror-stricken situation? Ours was a habitation of merely fifteen to twenty houses. You were not here, either. It was beyond our capacity."

Father was silent on this explanation. Suddenly, the room filled with a strange seriousness. Sukdev wore the turban again on his head. He wiped the eyelids with his dhoti.

"Father, we didn't lie happily." He continued. "But nothing is more valuable than one's life."

"Let's leave that topic aside," Father said. "There is no meaning in repeating what has happened earlier. Jagnya, please go in and ask to make some tea. Count the number of people." He asked them to leave the topic aside but it was difficult for him to drop it completely from mind. Hearing what the collector had told him, he had asked for the collector's suggestion, "What is the remedy to it, now?"

He had replied, "You can approach the court and get the work stayed. But that will be time consuming. Complaining to our department would not be worth either. Digging their own well deeper than Anantrao's may help Harijans in getting more water."

Father had not liked that reply but he later realized how this suggestion could prove a remedy for the problem. Then he started deepening Sonawanes' well. Initially he employed some workers. As a result, Anantrao started digging his well more forcefully. Father called an engineer friend. He said, "Boring would be better than digging. With three to four bores, you will certainly get water below."

Father was about to recall that engineer when Kundlik said, "It was that engineer who taught Anantrao a true lesson, didn't he?"

"Undoubtedly!' said Bajaba enthusiastically, "He was a Brahmin, wasn't he? That engineer? Initially when he had visited our colony, he was holding a handkerchief on his nose. He had carried his own water bottle. But when Father showed him the problematic site of the well…. he got so charged! I have no words to explain."

"Do you remember what he had said to Jagnya? He had said that he would bring the Ganga to our doors and that he was not at all less powerful than Anantrao. He proved his words by doing what he had said."

"Oh…. yes…. It was like a war being fought. We were far scared. It was really beyond our understanding to predict anything."

"Seriously!" Bajaba said, thumping on the lap, "Everywhere it was like the sound of gunshots. Anantrao dug one foot below and the engineer two feet. He simply defeated Anantrao."

Father simply kept listening to them. Anantrao had also started the bore work on the same day. Two giant yellow trucks were standing in front of each other. The place was crowded by many people. People from other villages had come to watch the whole show. The engineer had asked Father when he broke the coconut as a holy sign to begin the work, "How many feet should it be down?"

He had said, "I don't care even if it reaches the bottom of the Earth. I need water. That's it."

Realizing the gravity of his intention, the engineer had started working hard. Both the machines were drilling the land forcefully. People were shouting. The whole neighbourhood was full of black smoke. The babel there was making it impossible to know who was saying what. Men on both sides were abusing each other. Spitting consistently. The site resembled a warfront.

The war continued throughout the day and the afternoon sun heated people's temper even more. Father kept thinking of stopping it somewhere and being satisfied with whatever water they could get. Anyways, nobody owned the brook water. Their stoppage would have made Anantrao stop too. Else it would continue endlessly.

But in reality, he could not stop it. He visualized those days before forty years……indiscriminate firing from the machine guns. The unbearable throbbing of the tanks. Yelling of children and women. Buildings collapsing like a pack of cards. Father kept on telling himself that the war was inevitable. One cannot run away from it. He didn't know the reason for which he had participated in the World War. But he was aware of the reason behind this war now. It was inevitable... He had warned himself, "You had run away that time. Don't repeat it this time!"

No one could understand what the engineer had done that time. But it was only Sonawanes' well that got jets of water shooting off. It became difficult to work there. Anantrao's well was dry. It was only powdered stones and sand coming up from the well. He continued digging the well furiously but couldn't get water below. Helplessly he stamped feet and left from there. Sonawanes danced happily. The engineer laughed out loudly and said, "See, I have brought the Ganga, haven't I? Tell the man with the cap that he is capable only of wrestling. He won't be able to know that we have bored horizontally, will he? Enjoy, here you have ample water, as much as you want!"

People kept recalling the old memories and Father was sitting among them with a gentle smile. The event had a wide publicity. All the newspapers in the district had published the news. People savoured the discussions regarding the struggle for water and Anantrao's retreat. Everywhere people had Father's name on their lips. But that publicity had an adverse

impact. Anantrao got provoked very badly. He decided to drive out Father from there and started spreading bad rumours. He could use his influence at the higher level. He lodged complaints there.

"Father," Bajaba brought him back from the world of memories asking, "Is it true that the government has asked you to leave the country?"

"Yes, it is true," said Father with a smile on face. "Your government has asked me to leave the country. They had a fear that I might convert you."

"Seriously feel like abusing the government," said Bajaba angrily. "Why didn't that government ask us? We would have rightly said that our Father has not done any such thing."

"I am of the same opinion," Jagnya volunteered, "Can't we do anything? We will send a petition signed by all."

"It is of no use now, Jagnya," said Father with his hand on Jagnya's back, "I have an evening flight the day after tomorrow."

"Damn it!" said Jagnya. "You did so much for us. Shouldn't we be able to do anything for you?"

"Seriously! It was all due to your noble efforts that we could get water. I really don't understand how we are going to repay the kindness and benevolence you have shown to us."

"Please don't feel so." Father interrupted them. "Run the scheme well. That will be a true reward for me. Distribute the water fairly. Don't quarrel with each other. That way you will progress. Oh, that reminds me of something. I have got a spray pump for you as a gift. You can use it to spray pesticides. It is there in that corner. Please get it here."

Father picked up that pump and showed it to all. He removed the pipe and showed them how to fill it with the pesticide. He also showed them the way it was to be filled with diesel. People were excited.

"This is fantastic, really." said Kundlik. "Now there is no need to beg in front of anyone for this. We can get the pesticide, fill in this pump and spray."

"Father," said Jagnya, "We have got a gift for you too. As you are leaving. Can someone please get those things here?"

Jagnya made Father sit in the middle of the bed and garlanded him. Applied holy red powder on his forehead. He also draped his back with a purple shawl as a symbol of honour on behalf of all.

He said, "Kindly accept this shawl as a token of love from all of us in the colony. You protected us with a unique deed, what can we do for you? So, we have brought this shawl." "Yes, please accept this small token from us."

Father was deeply moved. He had a sudden lump in his throat. He was speechless for some time. With the shawl on his back, he got up and said in a voice full of emotions, "I am very thankful to you all, friends. Please don't be under the impression that I have obliged you. Everything belongs to Him. Who am I to give? It was because you contributed efforts and broke the stones that you got the water. It all belonged to you. I just happened to be a contributor. I am thankful to you for the opportunity you all provided me to work with you and for the love you doted on me. Please forgive me for any mistakes or if at all I have said anything wrong during all these years. I would pray for your progress and happiness forever."

There was complete silence then. Some snacks were served with a cup of tea. Everyone finished it and sat quietly. The world outside was silent. The gloom spread across all of them.

"Shall we take your leave, now?" asked Jagnya awkwardly. "Keep us in your memories. Don't forget us. The whole credit of our prosperity goes to you."

"We would like to leave Father," said Bajaba and he touched his feet.

Hanmantya and Kundlik bowed on his feet too. Sukdev bid goodbye with his shaky hands. One by one, all left the room.

Father came out and stood there on the veranda. Walking slowly on the ground, Sonawanes reached the gate. They were repeatedly looking back. Their hands were being waved frequently.

"See you, Father," he could hear a low voice from a distance. Father waved a hand. Shortly, all turned on to the road and disappeared. Father stood looking at the road for a long time with his hand in the same position even after they disappeared.

The mission hospital building was beside the road. The church stood behind it. High with a triangular roof. The church had a fresh green lawn maintained in front of it. The bishop was sitting in a chair below a tree. He stood up as Father went to him and greeted him. Holding Father's hand, he helped him sit in a chair near his own.

"I am taking the night train," said Father after some time, "I have come to say goodbye to you."

Bishop nodded his head gently and smiled. He was dark in complexion. His face had old marks of measles. He had a bald head. Wore glasses with a golden frame. Though aged, his skin had a glow. His physique was somewhat broad. He wore a white gown and the cross in his silver chain kept moving on his chest. His face would look rude and strict. Hearing Father, he gently said, "How would you be going?"

"From Delhi," said Father. "I have some formalities to complete. The flight is scheduled for the day after tomorrow."

Bishop smiled and nodded head. Both of his hands rested on his lap and the fingers intertwined each other.

"I am sure the Society has planned something for you," he said, "I mean, for the future."

"I hope so," replied Father. "As of now, I will go to Germany. Will know about it once I reach there."

"Yes, they may ask you to work in a seminary perhaps."

"Possible," said Father. "But I don't know anything."

He said this but he was aware that he would need to stay in a seminary somewhere in Germany. He had devoted his whole life to the church. He was in sound health. But it was not possible for him now to visit any new country. Now he was destined to stay in a seminary far away in the jungle. In an inanimate, cold climate there. In an unnatural quietness. Reading the same books again and again. Explaining its meaning to himself. Spending a lonely, empty life separated from the world. The rest of the world would keep enjoying its own pace of life. Running factories. Emitting vehicular smoke. Building high rises. Laughing sportively. No one would need him there. Certainly, they would not spare time for him. He would continue the boredom of preaching in front of some old folks. And leading the lonely life the remaining days. He was not willing to live such a life. He wanted fresh and open air like this. With people around everywhere. He would not mind a mountainous pile of problems. He wanted work. Plenty of work. The work that was necessary.

But he did not say anything. He knew that the bishop wouldn't understand even if he explained. He sat looking at the church behind.

"We feel sorry for the decision by the Government of India." Bishop said after some time. "We feel sorry to lose you. But you are not a citizen of this country. So, nothing can be done. We are bound to follow the rules laid down by the government."

"Yes. It would have helped to be a citizen of this country." said Father. "I feel the same. But at that time, I had an impression that it wouldn't make any difference. We are concerned with service."

"You are right." said Bishop. "We are concerned with service. Whether here or anywhere else. We want to serve humanity. The nation does not matter."

"But I used to like this country," said Father, looking around. "The earth, wind and water here. The people of this land. I had decided to spend my whole life here."

Bishop responded with a gentle smile to this. He removed his hands from the lap and folded them. "One should love mankind," he said. "The national boundaries carry no meaning. One should consider people at all places to be one's own people."

Father did not respond. A kite was moving slowly around the tower of the church at the back. It had attracted his attention for a long time. He continued staring there. It was flying against the clear blue sky. There was a crystalline statue of Mary with a baby on the church tower. Beside it was a bright brass bell in a niche formed with bricks. The whole building of the church was covered with yellow twilight.

"I don't understand why the government should do it." he said to himself. "What exactly have I done that caused them to ask me to leave?"

Bishop simply kept listening to him. He did not reply.

"I worked for the poor here. What was wrong with it?"

"You should have run the school," said Bishop.

"No, I don't think so." Father shook his head restlessly and said "The problems of this society are not going to be resolved merely by education. I told the inspection committee the same thing. It won't help by making the children study and teaching them prayers. First of all, the poverty here should be eradicated. Else nothing is going to be possible. The committee didn't accept it."

"No. I don't mean so." said Bishop. "Our job is to serve. Our job is to wipe off the tears from the faces that are full of it. We are here to guide those who have lost their path."

"What else did I do then?" Father said irritably. "I gave water to those who didn't have it. Food to those who were hungry. Extended a helping hand to those who had fallen in the pit. How exactly was it different from what I did?"

"There were law and order problems," Bishop said seriously.

"But it was wrong propaganda." Father leaned ahead as he said restively, "By those who don't like the betterment of the poor. This country is fated to experience it always. Those people will always oppose. The landlords with vested interests. Mere service delivery won't work. Why don't they understand this?"

He went on expressing his mind and then realized that he was in front of the bishop and his voice was at a high pitch. He saw that Bishop was looking at him steadily.

"I am sorry," said Father. "I spoke more than required. Forgive me please."

Bishop raised his hand, "Steady," he said, "Steady yourself!"

The sun was on its descent lengthening the shadows of trees. Father kept his hands on the chair and covered his face with

palms. Bishop kept himself stunned for some time and then stood up minding his gown. He walked closer to Father and touched him on his back. "Come, I will pray for you," he said. "Let us go to the Lord. The prayer will help you."

Father got up with a heavy heart and entered the church slowly.

He reached the airport long before the scheduled time of the flight. But he checked in and sent the luggage in as it would be an unnecessary carriage for him. While he was before the counter, a tall and stout person with trimmed hair approached him. Father looked at him questioningly.

"Karhadkar," he introduced himself. "I am from the Home Ministry." Saying so, he produced his identity card.

Father smiled at him.

"It seems you are here to verify whether I am really leaving or not." He said.

"No. Not exactly," Karhadkar said politely, "But you need to sign some documents."

"Hasn't it been over yet? I spent my whole today in signing papers."

"I am sorry, sir. But some documents need to be signed at the time of leaving. Let's sit there, please."

Father filled up the forms required by him. He had to sign some three-four papers. When he finished it, Karhadkar said, "Can we have a cup of coffee, if you don't mind? You still have enough time before the departure."

"Fine, let's go," said Father. "Let me enjoy the last bit of Indian hospitality."

The restaurant was on the first floor. It had a glass wall on one side. Karhadkar selected chairs near those glasses. The

widespread open tarmac of the airport was visible from there. The long spread of the runway narrowed down and disappeared at a faraway distance. The airport was otherwise a huge ground except the tarmac. Patches of red, dusty sand were visible. With some bushes grown here and there. It was fenced by a white concrete wall and beyond that was a similar ground full of green bushes. A thin white strand of buildings on the distant horizon. A plane had just taken off somewhere and was flying higher like an arrow.

Karhadkar did not say anything as they sat across the table. He ordered coffee. Father was looking outside. They faced each other as Father looked inside.

"Hope you won't need any more signatures once I reach there." He asked.

"No, certainly not." said Karhadkar. "Please do not misunderstand us. But the immigration rules are quite troublesome these days. It is not that I came because something was missing. I belong to the same district where you worked. I was dealing with your case. I had heard a lot about you. That's why I came..."

"What did you hear?" asked Father. "If you have believed in hearsay, you would be wrong."

"I didn't mean so. Regarding your work. Ours is a drought-prone district. So, the work you did was certainly necessary. It was quite valuable."

"If that is the case, why is your government asking me to leave the country?"

"Well, let me put it properly," Karhadkar took some time to speak and said, rubbing a hand over another, "The State is a huge machinery. It doesn't have a nose, ears, or eyes like a human being. It looks alive because it moves. But one part is

not associated with another. We have a proverb in Marathi which means innocents have to bear the heat along with the culprits. The same is true with the government."

"I didn't get you."

"I mean to say that the government has a general policy regarding the foreign missionaries. It is not implemented discriminately. People implementing the policy are different from those who make it. We work as per the rules. On the basis of whatever orders are issued from the higher authorities."

"But I have not done anything which could scare the government." said Father. "I haven't uttered a single word relating to religion while working with people throughout my entire stay here. Forget others, not even in front of people belonging to my religion. I haven't even been to church on many Sundays."

"No. That is not the case." Karhadkar placed the cup of coffee brought by the waiter before him and said, "Please, here's the coffee."

"The leaders who didn't like my work spread such words against me. It was not true. I have been trying hard to advocate my case to everyone. The government should have verified the facts. A person like you could have been deputed on such a mission. In fact, the work done by me was the responsibility of the government. Isn't it the responsibility of your government to help the Harijans? I actually eased the burden the government otherwise had to carry. And still the government asks me to leave the country? Strange!"

Karhadkar kept stirring the coffee with his head down. He didn't say anything. Father stared at him for some time and then started looking outside again. Evening was casting its spell. The glass walls made the outside picturesque. A giant

plane had just landed and rested on the runway spreading its wings.

Karhadkar finished his coffee. He wiped his lips with a handkerchief. He waited for Father to keep the cup down for some time and then said with a clear look at Father,

"I will answer your question. Actually, I am not supposed to disclose it to you, but you're leaving this country now and you will carry this misunderstanding forever if I don't tell you this. So, I will tell you."

He was quiet for some time. As usual, he rubbed his hands against each other. Father was curious to hear him. Karhadkar continued,

"It is true that the government has a policy towards foreign missionaries which is not in favour of you. But we take the decisions only after verifying the facts. We were aware that the reports against you were submitted by the leaders who had their vested interests. We knew that. The government has not taken this decision merely on the basis of those reports. I think your work was examined by your own church. A sort of…."

"Internal evaluation," said Father.

"Correct. So, it was a committee. We had the report submitted by that committee. Before finalizing our decision, we asked for the committee's opinion about you and…. they…"

"What about them?" asked Father.

"They gave an undertaking which said, 'We do not encourage white missionaries to work within our country.' It is their sentence. I am conveying to you as it was written. They did not wish the foreign missionaries to stay here. I think you got the point! What else could the government do then?"

Father was shocked for a while. Suddenly he could connect the link. He remembered that the incident at Sawarde had shaken the church. The establishment was rattled. There were some people there too who did not like his work. They appointed a committee. Consisting of four members. Father had almost a quarrel with them. He had tried his best to convince them but none of them would listen... Their dislike for this kind of work was clearly apparent. When Father had said to them, "This nation suffers from different problems.", one of them reacted caustically, "We don't need to hear this from foreigners." He was under the impression then that it must have been due to their dislike for his work. But now he realized suddenly that the reality was different!

Karhadkar looked at his watch after some time and got up. He shook hands with Father as he got up.

"I should make a move now," he said. "I met you very late but am happy that we met. One more thing. You can apply for a tourist visa any time. There won't be any difficulty. That will allow you multiple visits to India. And please do come. You will understand many things which were not understood earlier. I wish you a pleasant and happy journey. Goodbye."

He then left the restaurant tapping the heels of his shoes on to the floor.

Father kept staring at him for some time and then turned his eyes outside. The chain of events, like a motion film, passed swiftly before his eyes as he was looking outside. The colony in Sawarde. Those people with short built and dark complexions. Poor and sly. Suppressed and smiling. Loving and deceiving. The fiery sunlight on the plains there. The well. The clean, bright water of the canal flowing ahead in its own trance. That Anantrao with squinted eyes. The collector with gloomy eyes. That committee of four members holding bayonets. And the tall church tower in the blue sky.

He felt that all this was quite confusing and beyond his understanding. As rightly said by that officer. It rains from the sky, the grains spring from the earth and people live by the grains. But they have myriad ways of living. The life! Where does it come from? From the earth? Or from human beings? He never understood it. Perhaps he wouldn't be able to understand it in his lifetime.

His hand rested on the table. As he looked at it, he thought whether it was due to the difference in the colour. He covered his body with a white gown so as to hide the skin colour. Because white dissolves everything. But that is superficial. Like this gown. The colour inside never changes. It is never hidden even if covered. Or is it a punishment for his old sin? A punishment for the sin that was committed by him though unknowingly? He went on killing all those who were not like him. All those whose noses, colour, eyes were different from his own. Isn't it a penance for that action?

He was baffled completely. He thought it would have helped had the officer not told him this reality. Now he would never believe in the white colour. Henceforth he would examine the colour of the skin and eyes of a person wearing a white attire. He would first recognize the difference between himself and that man. He had sought refuge in this shelter so as not to be troubled by the differences in colour. But now that sanctuary was shattered. He did not own anything now that he could call his own - house, family or something that he would yearn for. The family that he had thought of being big was in fact very small. Like others, it also had the walls. He had wanted to live in this hot and earthly country. So that he could forget the old times, the history. He was hoping to find the light. But this land did not want him.

He kept looking outside, stunned and helpless. Evening was casting its spell. The surroundings so far clearly visible had

started darkening. Like a picture distancing itself from the vision. A grey whitish darkness was forcing itself everywhere. A yellow light blinked far on the horizon and then gradually the lights came on one by one. Father kept on staring... Shortly, he heard the announcement for boarding.

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Multiple Choices the Only Choice: Pandemic-Stricken Online Test of Writing Skills in English

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Abstract

The article reports how the online Multiple Choice Questionnaire (MCQ), an assessment method for testing writing skills in English was dealt with despite the challenges inherent in the task. The Direct Response method wherein the examinees write compositions has been accepted as the most appropriate assessment method of writing skills worldwide. However, this article reports on how the challenge was converted to an opportunity to explore an effective way to implement the method using discourse markers and linking devices as essential criteria to assess the cognitive skills in writing. The paper also recommends that a blend of MCQ test and direct response makes the assessment effective.

Keywords: MCQs, online test, writing skills, assessment method, direct response

Introduction

The unprecedented disaster of Covid-19 throughout the world created a major challenge for education as a congregation was the primary method for teaching-learning. The 'social distancing' led educators to look up to digital platforms for teaching. Virtual classrooms became a part of reality rather than a far-fetched notion. A developing country like India accommodated the virtual reality of their e-classrooms replacing physical classrooms, but the stakeholders worried about the nature of the assessment. The concern was because the pandemic struck India in March, the month of examinations. Whether multiple choice questions (MCQ) or open-ended questions, the format for the examination became an issue. After discussions, the University of Mumbai announced

its resolution to conduct online examinations with multiple choice questions (MCQs) as the assessment format. This article explores a few MCQ strategies the researcher tried out to assess writing skills.

Literature Review

A literature review shows that MCQs are widely used for natural and social sciences compared to arts and humanities (Boitshwarelo et al., 2017). Further, MCQs are limited to assessing surface knowledge and cannot be applied to assess critical thinking and synthesis (Polat, 2020). Arooj et al. (2021) reports a significant correlation (r=0.73) between surface approach and MCQs; and short essay questions to deep approach (r=.80). On the other hand, other studies (Douglas et al., 2012; cited in Boitshwarelo et al., 2017; Simkin & Kuechler, 2005; cited in Boitshwarelo et al., 2017) state that MCQs are suitable for assessing the cognitive levels. Boitshwarelo et al. (2017) observe that case study-based MCQs can also be used to facilitate higher-order learning. These authors point out that online tests are used to assess meta-knowledge (creativity and innovation, critical thinking and problem solving, and communication and collaboration) but not for assessing humanistic knowledge (live/job skills, ethical and emotional awareness, and cultural competence).

Writing skills are critical for professional and academic success. Two methods have generally been taken to measure and evaluate writing skills—the direct (essay writing) and the indirect (MCQ) methods (Cooper, 1984; Stiggins, 1981). Comparing the two methods, Cooper (1984) has thus summarized that the indirect assessment focuses on word and sentence levels characteristics like mechanics, diction, usage, syntax, and modification. In contrast, the direct assessment focuses on discourse level characteristics like a statement of thesis, clarity, organization, and rhetorical strategy. Cooper also notes that essay tests are considered more valid than MCQs to measure writing ability. He attributes the low-test score correlation between essay questions and MCQ to speed fluency and low reliability of essay questions. When the essay questions are made reliable through multiple assessments or statistical corrections for unreliability, the performance on essay tests and MCQs are closely related.

Breland and Jones (1982, p. 15 cited in Cooper, 1984) have argued that the essay tests 'may overlook important sentence-level indicators of writing proficiency'. The study further showed that 90 per cent of essay

tests were rated neutral on the use of modifiers, an important indicator of students' overall proficiency; Cooper has drawn attention to the fact that MCQs can address this critical skill. Brown and Abdulnabi (2017) have emphasized the need for statistical evaluation of items in MCQs before using them to ensure that high-quality items are used to draw inferences on performance and grading. They conclude that establishing the credibility of assessment is critical and requires commitment and effort for quality assurance in MCQs.

Methodology

The Communication Skills in the English paper focuses on developing four communication skills: reading, writing, speaking, and listening. Reading skills are divided into grammar, editing, comprehension, and summarization, and writing skills into essays, emails, reports, stories, blogs, and formal letters. The offline examination consisted of a blend of objective questions and questions expecting descriptive writing in response to assessing creative and formal writing skills. However, the pandemic made it mandatory to assess writing skills through MCQs.

The aspects of writing, including content, ability to generate ideas, logical coherence (and cohesion), rhetorical techniques, and tone flexibility, were challenging to test through MCQs. The teaching fraternity was invited to answer a WhatsApp questionnaire on the challenges in setting MCQs for testing writing skills. Based on the answers and the researcher's thinking, it was decided to use materials (e.g. contents from essays and articles, etc.) relating to real-life contexts. The following aspects were finalized as the essential areas to be tested through MCQs while testing the writing skills:

- Discourse Markers
- Content Building
- Use of Modifiers
- Organization of Content/Logical Coherence
- Creativity
- Register
- Tone of Communication
- Ability to generate ideas
- Editing

Of these, the ability to generate ideas and to edit were excluded from the MCQ assessment. The former was too challenging, and the latter was considered in another syllabus unit.

Time could be a constraint in using MCQs for testing writing skills as this pattern reduces the time allotted for examination. However, as the test could not expect the examinees to produce any written responses, it became obligatory for the paper setter to provide sample write-ups as a part of the questions to judge various sub-skills involved in writing. Therefore, the examinees needed to read through every write-up for different questions. To address this, the selected written material was reduced to a maximum of 3-4 sentences per question, and more than one question was based on one paragraph wherever possible.

The questions were framed as follows to assess various aspects of writing skills:

Discourse Markers: A short paragraph with multiple options were given, and the examinee had to identify the correct option. .

For example: *Read the paragraph and choose the option that fits the blank.*

"The advantages of yoga are initiated because you're focusing on internal peace. Self-realization, focus, relaxation, and harmony are the foundation stones of yoga.

One of the magnificent things about yoga is that regardless of the benefits it produces, there is no charge."

The paragraph can be best looked at as the _____ of an essay.

a. Conclusion b. Beginning c. Middle d. End

Such paragraphs were used to test comparison, illustration or cause and effect relationship skills.

Content Building: A paragraph or a sentence from the prescribed texts with a missing part was given, along with a few options. The examinees had to select the option that best fitted the blank.

Use of Modifiers: Sentences with missing modifiers were given. The examinees had to select the correct modifier and fill the blank.

I have _____ found my online classes engaging throughout the pandemic.

a. exceptionally b. hardly c. at first d. knowingly

Organization of Content/Logical Coherence: Four jumbled sentences

from a paragraph were provided, and the examinees were asked to identify the correct sequence of the sentences as a paragraph. The multiple choices included four combinations of sequences, including the correct one.

Questions were also framed, providing a sentence with a blank space. The examinees were expected to choose the correct linking device from those given as the alternatives for the blank space.

Creativity: A small paragraph from an essay with multiple titles were given, and the examinees had to identify the title most suitable to the paragraph. Apart from this, a brief paragraph with a missing sentence was provided in the main question and the examinees were asked to choose the correct option containing the sentence that could fit in the paragraph

Register: Questions were framed with multiple options providing different expressions used in a specific type of content. For example, the main question asked the examinees to identify the expression most suitable to a specific part of a formal email.

Tone of Communication: As the examinees were expected to be familiar with different functions of an essay like persuasive, expository, reflective, etc.a question was framed with the beginning paragraph of an essay provided. The examinees were expected to identify the tone of communication in the essay.

Observations

- The areas of writing skills in English, which sounded challenging to be addressed by MCQs, were thus covered through discourse markers, organizational devices, etc.except for the creative ability to generate ideas. Perhaps writing skills cannot be tested by MCQs alone.
- Informal discussions and the existing research support the researcher's opinion that a blend of MCQ and direct response essay tests can serve the purpose of assessing the micro as well as macro skills involved in the process of writing.
- More still needs to be explored in the practical implementation of MCQ testing of writing skills.
- There is a need to develop more assessment strategies to develop MCQs for testing writing skills. Researchers must focus on using

advanced, technology-based tools and developing advanced software.

- It undoubtedly requires several years to develop a new assessment method. The success of the method depends on how effectively it can bring an observable change in the students' and teachers' behaviours.

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