Textile Dyeing Industries and Land Degradation

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Abstract

The textile and dyeing industry is one of the oldest and prominent place in India. An estimate shows that textiles account for 14 per cent of India's industrial production and around 27 per cent of its export earnings. Textile industries get raw materials from dyeing industries. A large number of industries are concentrated in the States of Tamil Nadu. These industries provide employment opportunities to the neighbouring communities. At the same time, these units consumes enormous amount of water and discharge industrial wastes. These industrial waste waters degrade the environment and create many problems in terms of air, water and land pollution. All these pollution affect not only humans and also pollute cultivated land and groundwater. In order to understand the nature, extant, causes and consequence of this problem a study has been made at Karuppampalayam and Melappalayam villages of Karur District. The study results highlight how the textile dyeing industrial effluents degrade the soil fertility, groundwater, changes in soil structure and low crop yielding in and around the industrial regions of Karur District, Tamil Nadu.

Key words: Industrial Pollution, Environmental Degradation, Loss of fertility, Groundwater pollution, Changes in soil structure of the land and low crop yielding.

Introduction

During recent years rapid industrialization has occupied core of our socio-economic and political sphere. These developments have significantly contributed towards employment opportunities, national and international trade and overall improvements in the quality of life. At the same time, these industries released in terms of effluents either in gaseous or liquid form; have polluted the air, soil surface and ground water leading to environmental degradation.

In India, textile industry is one of the oldest and largest sectors. There are more than 700 large textile mills mainly concentrated in Ahmedabad, Mumbai, Coimbatore, Tirupur, Karur, Kanpur and Delhi. Dyeing process in textile industries depends on large quantities of water. This amounts to about 16 percent of total water consumed in the textile mills (Denold, R.1984). In textile dyeing processes about 20-60 liters of water are consumed per kilogram of clothes and large quantities of effluents are released during the process operations. The dyeing industrial waste water is dark and red colour with high suspended solids in it. The solid interferes with the self purification of stream by reducing the photosynthetic activity of water plants. The high dissolved solid also affects the human life water bodies and land degradation.

The textile dyeing industrial effluents generates a number of effects on the society as well as on the economy. The economic are in the form of damage of property, damage of land, reduction of

crop productivity loss of plants and animals of economic importance, reduced fish catch, reduced drinking water availability loss in recreational and other amenities, loss to industry and above all the cause of illness and death caused by such pollution. These economic losses in one way or the other affect the society.

Coimbatore is one of the textile city in India. There are about 700 dyeing and bleaching units located in and around Coimbatore. Textile dyeing consumes lot of water and the effluents are released in the waste water and directed to the Noyyal River. When these effluents enter into Noyyal River it causes severe damage to the quality of water and in terms of affects the soil fertility and groundwater. The discharge of textile waste waters on land for agricultural purpose also affects the crop and soil due to high dissolved salts. The suspended solids, which are present in waste, may carry out clogging of soil pores. The sodium, present in the waste leads to hardening of the texture of soil and also prevents penetration of roots in soil its leads to poor productivity of crops.

The dumping of dyeing effluents with sludge increase the soil organic carbon, potassium, calcium and consequently reduce the water holding capacity. The biological cycle of soil related to nitrogen and phosphorous is slowly altered. Soil texture and permeability is highly affected due to sodium content of discharged waste. The population of beneficial microbes is also hindered by sodium alkalinity with salinity in high concentration, which in turn impairs the growth of plants. The dilution of textile dyeing industrial effluents affects on soil properties, germination and growth of beans and lady's finger. The change in soil composition was maximum with the use of undiluted effluent. Dilution of effluent to 75% or 50% resulted in better plant growth with less change in soil. The raw dyeing factory effluent at different concentrations drastically reduced the germination of seeds and the vigous index of seedlings in crops like rice, finger millet, cowpea, soybean and maize. The nature of pollution that accompanies the dyeing industry is primarily due to the non-biodegradable nature of the dyes along with the strong presence of appreciable amounts of toxic trace materials, acids, alkalis and carcinogenic aromatic amines in the effluents. Thus, these types of industries cause severe damage to the entire eco-system and affect not only the lives the people in terms of health but also the very basic agricultural activities of the poor farmers in surrounding the industrial regions.

The Noyyal basin, polluted by about 800 dyeing and bleaching units of Tirupur, has become a battle ground for confrontation between agriculturalists, on one hand, and the textile processing industry, on the other. The farmers cannot use water from the river as effluents have been draining into the river for years. The bleaching and dyeing units use bleaching liquids, soda ash, caustic soda, sulphuric acid, hydrochloric acid, sodium peroxide and various dyes and chemicals. High concentrations of calcium, magnesium, sodium and chlorides have also been noted in studies carried out in the basin. Consequently the river water is highly saline. Ground water has also become brackish and considerably harder over the past 10 to 15 years.

Present study

Farmers from the Karur area have been using the polluted water from Amaravathi River and also from the ground for irrigation. This has resulted in deterioration in the physical and physiochemical properties of the soils. The soils have accumulated soluble salt and also turned alkaline. These soils have become very hard and compact, infiltration reduced and water percolation

restricted, the magnitude of soil degradation vary from site to site depending on the pollution level of waste water. Thus, these industrial effluents has been creating enormous changes in agricultural land in terms of loss of soil fertility, crops retarded, crops colour and also change of soil texture in this study area. The present study has been undertaken to study about how the effluents of textile dyeing industries affect agricultural land at Thanthoni block in Karur District, Tamil Nadu.

Statement of the Problem

Karur district is called textile city, because enormous textile industries are located in and around the district. The textile industries get raw materials from dyeing industries. These units consumes enormous amount of water as well as discharge effluents into river basin and on cultivable land. The dyeing industrial effluents degrades water quality, soil fertility and changes in structure of soil, environment and ground water. In order to understand the impact of textile dyeing industrial effluents how affect the agricultural land. The present study has been taken up two villages (Karupampalayam and Melapalayam) in Thanthoni block, Karur district, Tamil Nadu.

Objectives:

1. to study the socio-economic conditions of the respondents in Karupampalayam and Melapalayam villages
2. to understand the extent of pollution caused by the effluents of the textile dyeing industries
3. to examine the nature of damages on agricultural land caused by textile dyeing industrial effluents

The Method

Thanthoni block of Karur district was selected by the researcher for the present study. The researcher has selected Karupampalayam and Melapalayam villages from this block for the present study. More number of dyeing industries are located in and around the villages. The Karupampalayam village has 546 households and Melapalayam village has consists 744 households. The total of 1290 households the researcher has selected 30 per cent of the households from the total households of the villages by using simple random sampling method. Thus, total of 387 households are selected for the present study. The head of the household are the respondents of the present study.Using a well structured interview schedule the information and necessary data were obtained from the respondents and the data were arranged and classified for analysis. The analysis of the data and interpretation are presented below.

Results and Discussion

Table -1

Characteristics of Respondents (N=387)

Characteristics	No. of Respondents	Percentage
Age group		
Below – 30	43	11.11
30-40	99	25.58
40-50	136	35.14
50-60	66	17.05
Above – 60	43	11.11
Caste group		
Scheduled castes	143	36.95
Backward castes	69	17.83
Most backward castes	121	31.27
Forward castes	54	13.95
Educational level		
Illiterate	52	13.44
Primary level	130	33.59
Secondary level	118	30.49
Under graduate	52	13.44
Technical	35	9.04
Occupation status		
Wage labourers	122	31.52
Agriculture	97	25.06
Industrial workers	65	16.80
Government employees	56	14.47
Business	47	12.14
Income (In. Rs. Monthly)		
Below 5000	126	32.56
5000-10000	52	13.44
10000-15000	97	25.06
15000-20000	48	12.40
Above- 20000	64	16.54
Total	**387**	**100**

Table 1 presents the distribution of the respondents on the basis of age, caste, educational level, occupation status and level of income. From the table, it is observed that out of the total 387 respondents, 11.11 per cent of the respondents are belongs to the age group of below 30 years and 25.58 per cent of them come under the age group of 30-40 years. 35.14 per cent of the respondents are belongs to the age group of 40-50 years and 17.05 per cent of them the age group of 50-60 years. Moreover, 11.11 percent of the respondents are belongs to the age group of 60 years and above. Further, the table reveals that data on caste wise distribution of the respondents out of total respondents, 36.95 per cent of the respondents are scheduled castes and 31.27 per cent of them most backward castes. 17.83 per cent of the respondents are backward castes and 13.95 per cent of them

forward castes. It could be noted that the scheduled castes and most backward castes are the major categories and all the respondents are belong to Hindu religion in the study villages.

The table shows that data on educational wise distribution of the respondents. Out of the total 387 respondents, 13.44 per cent of the respondents are illiterates and 33.59 per cent of the respondents are educated up to primary level. 30.49 per cent of the respondents are educated up to secondary level and 13.44 per cent of the respondents are educated up to degree level. Only, 9.04 per cent of the respondents are acquired technical education Further, the table presents that data on occupational wise distribution of the respondents. Out of total respondents, 31.52 per cent of the respondents are wage labourers and 25.06 per cent of them engage in agricultural activities. 16.80 per cent of the respondents are working in industries and 14.47 per cent of them government employees. Moreover, 12.14 per cent of the respondents are engage in business activities.

The table indicates that data on income wise distribution of the respondents. Out of the total respondents, 32.56 per cent of the respondents are earn income below Rs.5000 per month and 13.44 per cent of them earn income in the range of Rs.5000-10000 per month. 25.06 per cent of the respondents are earn income Rs. 10000-15000 per month and 12.40 per cent of the respondents are earn income in the range of Rs. 15000-20000 per month. Further, 16.54 per cent of the respondents are earn income Rs. 20000 and above per month in the study villages.

Table-2

Age Wise Respondents' Views on Pattern of Land Degradation

Respondents	Nature of Impact of Dyeing Industrial Effluents				
Age Group	Loss of soil fertility	Ground water pollution	Acidity and low water retention capacity	Changes in structure of Soil & low crop yielding	Total
Below-30	10 (23.25)	10 (23.25)	12 (27.91)	11 (25.59)	43
30-40	28 (28.28)	58 (58.58)	4 (4.04)	9 (9.09)	99
40-50	75 (55.15)	45 (33.09)	6 (4.41)	10 (7.35)	136
50-60	37 (56.06)	16 (24.24)	8 (12.12)	5 (7.57)	66
Above-60	10 (23.26)	11 (25.58)	9 (20.93)	13 (30.23)	43
Total	160 (41.34)	140 (36.18)	39 (10.08)	48 (12.40)	387

χ^2 Calculated value: 89.43 ; Degrees of freedom: 12 ; χ^2 Table value 5%: 28.30

Table 2 presents that data on age wise distribution of the respondents and their views on pattern of land degradation due to the impact of textile dyeing industrial effluents. It could be noted that out of the total 387 respondents, 41.34 percent of the respondents have realized that loss of soil fertility and 36.18 per cent of the respondents have visualized that groundwater pollution. 10.08 per cent of the respondents have feel acidity and low water retention capacity and 12.40 per cent of the respondents have realized that changes in structure of soil and low yielding are due to the impact of textile dyeing industrial effluents. The majority of the 30-40 years age group respondents (58.58%) have visualized that groundwater pollution and 56.06 percent of the (age group between50-60) respondents have realized that the loss of soil fertility due to the textile dyeing industrial effluents. It is clearly from the above discussion that the textile dyeing industrial effluents creating land degradation surrounding the industrial region.

The chi-square test is applied for further analysis. The computed chi-square value is 89.43 which is greater than its tabulated value at 5 per cent level of significance. Hence, there is an association between age wise respondents and their views on pattern of land degradation caused by textile dyeing industrial effluents.

Table-3

Caste Wise Respondents' on Pattern of Land Degradation

Respondents	**Nature of Impact of Dyeing Industrial Effluents**				
Caste Group	Loss of soil Fertility	Ground water pollution	Acidity and low water retention capacity	Changes in structure of Soil & low crop yielding	Total
Scheduled Castes	75 (52.44)	46 (32.17)	10 (6.99)	12 (8.39)	143
Backward Castes	16 (23.19)	22 (31.88)	13 (18.84)	18 (26.09)	69
Most Backward Castes	60 (49.59)	45 (37.19)	6 (4.96)	10 (8.26)	121
Forward Castes	9 (16.67)	27 (50.00)	10 (18.52)	8 (14.81)	54
Total	160 (41.34)	140 (36.18)	39 (10.08)	48 (12.40)	387

χ^2Calculated value : 59.76 ;Degrees of freedom: 9 ; χ^2Table value 5%:23.6.

Table 3 indicates that data on caste wise distribution of the respondents and their views on pattern of land degradation due to the impact of textile dyeing industrial effluents. It could be noted that more than half (52.44%) of the scheduled castes respondents have realized that loss of soil fertility and (50.00%) forward castes respondents have visualized that groundwater pollution due to

the textile dyeing industrial effluents. The majority of (26.09%) backward castes respondents have visualized changes in structure of soil and low crop yielding caused by textile dyeing industrial effluents. It could be seen clearly from the above discussion that all the respondents have realized land degradation due to the impact of textile dyeing industrial effluents.

The chi-square test is applied for further analysis. The computed chi-square value is 59.76 which is greater than its tabulated value at 5 per cent level of significance. Hence, there is an association between caste wise respondents and their view on pattern of land degradation caused by textile dyeing industrial effluents.

Table-4
Educational Wise Respondents' Views on Pattern of Land Degradation

Respondents	Nature of Impact of Dyeing Industrial Effluents				
Educational Level	Loss of soil Fertility	Ground water pollution	Acidity and low water retention capacity	Changes in structure of Soil & low crop yielding	Total
Illiterate	12 (23.08)	25 (48.07)	5 (9.61)	10 (19.23)	52
Primary	59 (45.38)	54 (41.54)	6 (4.61)	11 (8.46)	130
Secondary	61 (51.69)	41 (34.75)	8 (6.78)	8 (6.78)	118
Under graduate	14 (26.92)	13 (25.00)	12 (23.07)	13 (25.00)	52
Technical	14 (40.00)	7 (20.00)	8 (22.86)	6 (17.14)	35
Total	160 (41.34)	140 (36.18)	39 (10.08)	48 (12.40)	387

χ^2 Calculated value: 51.90: Degrees of freedom: 12 ; χ^2 Table value 5%: 28.30

Table 4 shows that data on educational wise distribution of the respondents and their views on pattern of land degradation due to the impact of textile dyeing industrial effluents. It could be noted that the majority (51.69%) of the secondary level educated respondents have realized that loss of soil fertility and 48.07 per cent of the illiterates have visualized that groundwater pollution due to textile dyeing industrial effluents. Further, 25.00 per cent of the under graduate level educated respondents have realized that changes in structure of soil and low crop yielding due to the consequence of textile dyeing industrial effluents. It is clearly from above discussion that almost all

the respondents have realize land degradation caused by textile dyeing industrial effluents in the study villages.

The chi-square test is applied for further analysis. The computed chi-square value is 51.90 which is greater than its tabulated value at 5 per cent level of significance. Hence, there is an association between educational wise respondents and their views on pattern of land degradation due to the impact of textile dyeing industrial effluents.

Table-5
Occupational Wise Respondents' Views on Land Degradation

Respondents	Nature of Impact of Dyeing Industrial Effluents				
Occupational Level	Loss of soil Fertility	Ground water pollution	Acidity and low water retention capacity	Changes in structure of Soil & low crop yielding	Total
Wage labourers	49 (40.16)	59 (48.36)	5 (4.09)	9 (7.38)	122
Agriculture	53 (54.64)	25 (25.77)	6 (6.19)	13 (13.40)	97
Industrial Workers	18 (27.69)	34 (52.31)	8 (12.31)	5 (7.69)	65
Government Employees	21 (37.50)	12 (21.43)	10 (17.86)	13 (23.21)	56
Business	19 (40.42)	10 (21.48)	10 (21.28)	8 (17.02)	47
Total	160 (41.34)	140 (36.18)	39 (10.08)	48 (12.40)	387

χ^2 Calculated value: 52.08; Degrees of freedom: 12 ; χ^2Table value 5%: 28.30

Table 5 indicates that data on occupational wise distribution of the respondents and their views on pattern of land degradation due to the impact of textile dyeing industrial effluents. It could be noted that more than half of the (54.64%) agriculturist have realized that loss of soil fertility and 52.31 percent of the industrial workers have visualized that groundwater pollution as well as 23.21 per cent of the government employees have realized that changes in structure of soil and low crop yielding due the impact of textile dyeing industrial effluents. The above table clearly expressed that all the respondents have realize land degradation caused by dyeing industrial effluents.

The chi-square test is applied for further analysis. The computed value is 52.08 which is greater than its tabulated value at 5 per cent level of significance. Hence, there is an association between occupational wise respondents and their views on pattern of land degradation due to the impact of dyeing industrial effluents.

Table-6

Income Wise Respondents' Views on Land Degradation

Respondents	Nature of Impact of Dyeing Industrial Effluents				
Income (In Rs.Monthly)	Loss of soil fertility	Ground water pollution	Acidity and low water retention capacity	Changes in structure of soil & low crop yielding	Total
Below-5000	42 (33.33)	70 (55.55)	5 (3.97)	9 (7.14)	126
5000-10000	21 (40.38)	13 (25.00)	7 (13.46)	11 (21.15)	52
10000-15000	63 (64.95)	20 (20.62)	7 (7.21)	7 (7.21)	97
15000-20000	24 (50.00)	7 (14.58)	8 (16.67)	9 (18.75)	48
Above- 20000	10 (15.63)	30 (46.87)	12 (18.75)	12 (18.75)	64
Total	160 (41.34)	140 (36.18)	39 (10.08)	48 (12.40)	387

χ^2Calculated value: 81.35; Degrees of freedom: 12 ; χ^2Table value 5%: 28.30

Table 6 presents that data on income wise distribution of the respondents and their views on pattern of land degradation due to the impact of textile dyeing industrial effluents. It could be noted that more than half (64.95%) of the middle income group respondents (Rs.10000-15000 per month) have realized that loss of soil fertility and 55.55 per cent of the (below Rs.5000 per month) respondents have visualized that groundwater pollution due to the impact of textile dyeing industrial effluents. It is clearly expressed that all the respondents realize land degradation caused by textile dyeing industrial effluents.

The chi-square test is applied for further analysis. The computed chi-square value is 81.35 which is greater than its tabulated value at 5 per cent level of significance. Hence, there is an association between income wise distribution of the respondents and their views on pattern of land degradation due to the impact of textile dyeing industrial effluents.

Findings and Conclusion

Findings of the study indicate that the majority of the respondents are belongs to the age group of 40-50 years and most of them belong to either schedule castes or most backward caste. A good majority of the respondents have educated upto primary level. The majority of the respondents are wage labourers and agriculturalists as well as most of the respondents have earned their income below Rs. 5000 per month in the study villages.

The study results highlight that the majority of the respondents have pointed out that the textile dyeing industrial effluents degrade the agricultural land in terms of loss of soil fertility, ground water pollution, acidity and low water retention capacity and changes of soil structure and low crop yielding in the study villages. From the study reveals that the majority of the age group

(above 40 years) respondents have realized that loss of soil fertility and ground water pollution due to the impact of textile dyeing industrial pollution. Most of the schedule caste and most backward caste respondents have realized that loss of soil fertility and forward caste respondents have visualized that ground water pollution caused by dyeing industrial effluents.

From the findings of the study it is also evident that the majority of the secondary level educated respondents have realized that loss of soil fertility and illiterates have visualized that ground water pollution as well as the under graduate level of educated respondents have realized that changes in structure of soil and low crop yielding due to the impact of textile dyeing industrial effluents. The majority of the agriculturalists have realized that loss of soil fertility and industrial workers have visualized that ground water pollution as well as the government employees have realized that changes in structure of soil and low crop yielding caused by dyeing industrial effluents. Further, most of the middle income group respondents have realized that loss of soil fertility and the income group of below Rs. 5000 respondents have visualized that ground water pollution due to the impact of textile dyeing industrial effluents.

Further, the study reveals that the respondents have realized that land degradation caused by textile dyeing industrial effluents. It is significant that the textile dyeing industrial effluents have generated severe damages on agricultural land in terms of loss of soil fertility, ground water pollution, acidity and low water retention capacity and changes in structure of soil and low crop yielding. The study results highlight that irrespective of age, caste, education, occupation and income status, the respondents have expressed that the textile dyeing industrial effluents degrade the agricultural land and crops in and around the study villages.

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