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POLLUTION EFFECT ON POLLEN MORPHOLOGY IN INDUSTRIAL AREAS OF HYDERABAD, TELANGANA STATE, INDIA

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ABSTRACT

The present paper deals with the study of effect of industrial pollutants on pollen morphology in Uppal and Jeedimetla industrial areas of Hyderabad, the capital of Telangana state, India. Twenty four pollen taxa viz., ***Acacia chundra, Acacia nilotica, Ageratum conyzoides, Alternathera sessilis, Azadiracta indica*****, Caryophyllaceae type,** ***Celosia argentea, Cocos nucifera, Cyperus rotundus, Delonix regia, Eucaliptus teriticomis, Gmelia arborea, Grass pollen, Hyptis suaveolens, Mimosa latisilqua, Phoenix sylvestris*****, Poaceae type,** ***Prosopis juliflora, Ricinus communis, Sida acuta, Syzigium cumini, Trewia polycarpa, Xanthium strumarium*** **and** ***Zea mays*** **were recorded from Uppal and Jeedimetla industrial areas. In these pollen taxa considerable morphological changes were observed in pollen, i.e. shrinkage and color of the grain due to industrial air pollutants .**

INTRODUCTION

The atmosphere contains various gaseous and other particles which cause harmful effect to plants and animals. These pollutants may cause leaf injury, stomatal damage and growth reduction (Tiwari *et al*., 2006). The maximum air pollution is due to the industries and vehicles by releasing sulphur dioxide, nitrogen dioxide, particulate matter and carbon monoxide Leila Amjad *et al*., (2012) observed SO_2, NO_2, CO and APM in the air effect on structure and pollen development in *Chenopodium album* L., The pollutants like SO_2, NO_2, CO released by the industries, sticked to the dispersed pollen after dehiscence of anthers and causes morphological changes to the pollen grains.

MATERIAL AND METHODS

Hyderabad is the capital of Telangana State, which is located at 17° 22' N and 78° 28' E, with chemical industries in Balnagar, Uppal, Jeedimetla and Nacharam. The particulate matter (PM) or Aerosol was collected from two different industrial areas such as Jeedimetla and Uppal by using Resparable dust sampler (R.D.S. APM 460).

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Principle: Ambient air laden with suspended particulates enters the system through the inlet pipe in the sampler. As the air passes though the system, non-respirable dust is separated from the air stream by centrifugal forces acting on the solid particles. These separated particulates fall through the conical hopper and gets collected in the sampling bottle (* Dust box) placed at its bottom. Particulate matter was collected from Uppal and Jeedimetla industrial areas of Hyderabad on 18th November, 2014. The collected particle matter (PM) was processed by using of Erdtman's (1960) acetolysis technique to recover pollen. The pollen were studied under trinocular research microscope and photo micrographs were prepared.

RESULTS AND DISCUSSION

Most of the developmental activities such as industrialization, urbanization, and fuel boring and transport sector are increasing the air pollution in Hyderabad city due to continuous releasing of the particulate matter, SO_2, NO_2, CO and other chemicals into the air. According to reports by the Telangana pollution control board the air pollutant concentration regarding the particulate matter (PM) is less than 100 µg/m^3, SO_2 is less than 80 µg/m^3, NOX less than 80 µg/m^3 in the non industrial areas but in Uppal industrial area the PM is 124 µg/m^3, SO_2 is 4.9 µg/ m^3 and NOX is 23.9 µg/m^3 (Table 1) where as in the Jeedimetla industrial area the PM is 128 µg/ m^3, SO_2 is 5.2 µg/m^3 and NOX is 22.1 µg/m^3 (Table 2).

Table 1. Concentration of pollutants in Uppal industrial area

PM10	SO_2 µg/ m3	NOX µg/m^3
124	4.9	23.9

Table 2. Concentration of pollutants in Jeedimetla industrial area

PM10	SO_2 µg/ m^3	NOX µg/ m^3
128	5.2	22.1

*Particulate matter *Sulphur dioxide * Oxides of nitrogen

Twenty four pollen taxa were studied under trin-

Table 3. Occurrence of morphological changes in the pollen taxa

S.No.	Name of the pollen taxa	Exine shrinkage	Color change
1.	*Acacia chundra*	-	*
2.	*Acacia nilotica*	*	*
3.	*Ageratum conyzoides*	-	*
4.	*Alternathera sessilis*	-	*
5.	*Azadiracta indica*	*	*
6.	Caryophyllaceae type	-	*
7.	*Celosia argentea*	-	*
8.	*Cocos nucifera*	*	*
9.	*Cyperus rotundus*	*	*
10.	*Delonix regia*	-	*
11.	*Eucaliptus teriticomis*	*	*
12.	*Gmelia arborea*	-	*
13.	*Grass pollen*	*	*
14.	*Hyptis suaveolens*	*	*
15.	*Mimosa latisilqua*	-	*
16.	*Phoenix sylvestris*	-	*
17.	Poaceae type	-	*
18.	*Prosopis juliflora*	-	*
19.	*Ricinus communis*	-	*
20.	*Sida acuta*	-	*
21.	*Syzigium cumini*	*	*
22.	*Trewia polycarpa*	-	*
23.	*Xanthium strumarium*	-	*
24.	*Zea mays*	*	*

* Present - Absent

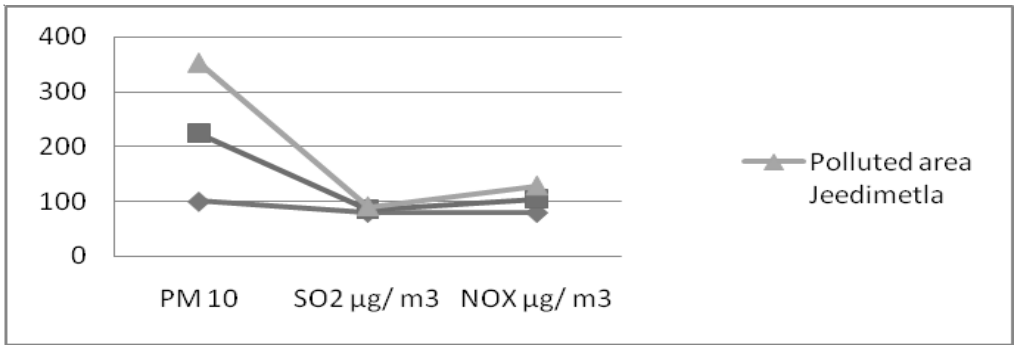

Fig. 1 Presence of PM, SO_2 and NO_2controlled and polluted areas

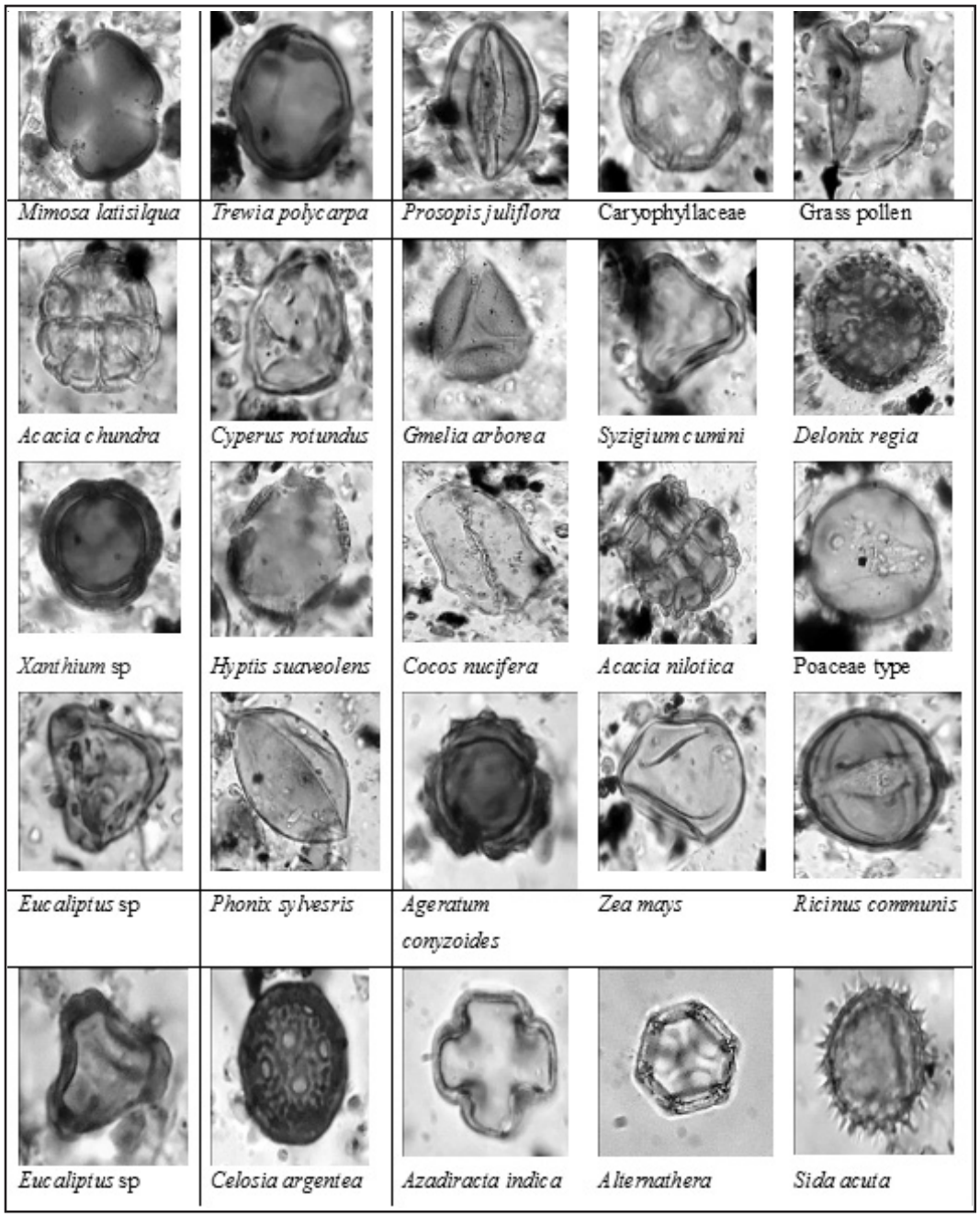

Plate 1

ocular research microscope and observed considerable morphological changes, i.e., shrinkage of pollen and color change in the grain (Table 3 and Plate is 1) due to industrial pollutants. Shrinkage of exine was observed in *Cyperus rotundus*, *Syzigium cumini*, *Hyptis suaveolens*, *Cocos nucifera*, *Acacia nilotica*, *Eucaliptus teriticomis*, *Azadiracta indica* and *Zea mays*. The colour changes were observed in all twenty four pollen taxa. The opacity and structure were changed in all the twenty four pollen taxa when compare unpolluted pollen recorded in karimnagar Kailas *et al*. (2014) and in Prabhakar *et al*., (2014) of Andhra Pradesh and Telangana state.

Effect air pollution on pollen morphology is due to the direct effect on pollen grains after anthesis and indirect effect in the inside of the anthers. The tapetal

fluids in the tapetum which are responsible to nourish the pollen in the microsporangium was effected by the pollutants and hence responsible for the abnormality of pollen morphology, i.e. pollen shrinkage and color change. Direct effects of pollutants on pollen are after dehiscence of anthers. The pollutants are directly affecting pollen grains and caused abnormality in the pollen morphology due to direct attachment of large amount of pollutants to the sculptured pollen grains.

CONCLUSION

These changes may be inside the microsporangium at the time of ontogeny of pollen grains due to pollutants effect on nutritive tapetal fluids or direct attachment of the pollutants on the pollen grains outside the microsporangium (anther) after dehiscence and release of pollen. Hence the pollen morphological changes are due to effect of industrial pollutants to tapetum indirectly before the dehiscence of anthers or directly outside the anthers after dehiscence. The pollen taxa recorded from the air of industrial locations of Uppal and Jeedimetla of Hyderabad, clearly signifies the air pollutants effect on pollen morphology.

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