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Induced Pollen Variabilities in *Plantago* species under changed soil conditions .

***Alok Raj and **G. Kumar**

*Botany Department, SMD Degree College M.N. Jalalpur Gopalganj

**Botany Department, Allahabad University, Allahabad.

Abstract:-An experiment was set up to study the effect of different soil types on the pollen variability of *Plantago* species. In order to determine the effect of different soil types on pollen diameter and pollen fertility in *Plantago ovata*, *Plantago lanceolata* and *Plantago coronopus*, first of all, the mature buds were fixed in Carnay's fluid. The fixed buds were subjected to squash preparation and the scoring was done in 5 to 7 plants randomly from each soil. The diameter of definite number of pollen grains was recorded with the help of stage micrometer and occular. After that the average value of pollen diameter and ferlility percentage was calculated. On the basic of bservations it can be calculated that any change in existing edaphic factor, may provide an effective stimulus for reducting the fertility. This is an indication for chromosomal abnormalities which are ultimate source of variations.

Key word: *P. ovata (Plantago ovata*), *P. lanceolata* (*Plantago lanceolata*), *P.coronopus*, (*Plantago coronopus*) .etc.

The genus *Plantago* belongs to the family Plantaginaceae which includes three genera VIZ. Bougueria (1 species), Litorella (1 species) and *Plantago* (over 200 species). About 10-14 species of *Plantago* are native of India. But for *Plantago ovata* which is cultivated for its seed husk, all other species are wild. The *Plantago lanceolata* and *Plantago coronopus* B-chromosome carrier species during our investigation it has been planned to study the effect of soil type on the pollen variability of *Plantago* species, four different types of soils were used i.e., control soil (Pure garden soil only) Organic soil (Pure cow dung), Sandy soil (Pure sand only) and usar soil (the mixture of garden soil and usar soil in the ratio 10:1).

Material and methods

The three species of the Genus *Plantago* were selected for the study VIZ. *P.ovata*, *P.coronopus* and *P.lanceolata*. The selected species are diploid with normal mitosis and meiosis. The seeds of different species of *Plantago* were procured through courty of Central Institute of Medicinal and Aromatic plants (CIMAP), Lucknow, Jardin Botanique de L Universite, Louis Pasteur de Strasburg, France and Narendra Deo Agriculture University, Kumarganj, Faizabad.

To determine the effect of different soil types on pollen diameter in *P.ovata*, *P.coronopus* and *P.lanceolata*, first of all the mature buds were fixed in Carnoy's fluid i.e., 3 parts absolute alcohol and 1 part glacial acetic acid for 24 hours. After fixation anthers were washed two or three times with 70% alcohol to remove acetic acid and then these were stored in the same

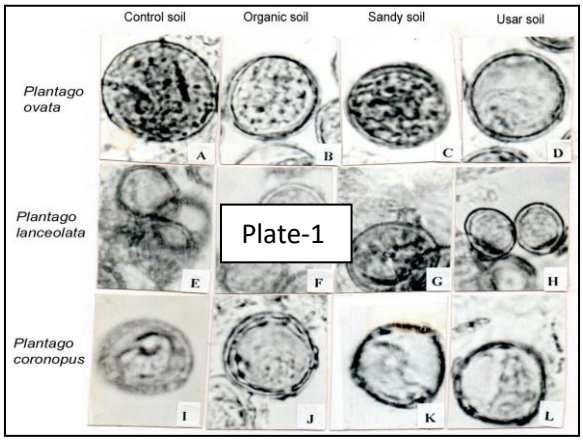
solution under low temperature at about 15ºC till further use. After that only one or two anthers were taken on a slide and squashed in one droop of 2% acetocormine solution. The slide was gently warmed and move stain was added with the help of rusted needle for improving stain. Finally the well stained anther preparation was gently pressed and coverslips were temporarily sealed with sticky wax. After the preparation of slide the diameter of definite number of pollen grains was recorded with the help of stage micrometer and occcular from each species in every type of soil. Then the mean of pollen diameter of each species in each soil condition was obtained. The data was then subjected to statistical analysis.

In orde to investigate the effect of different soil types on pollen fertility in *P.ovata*, *P.coronpus* and *P.lanceolata*, the definite number of microscopic field were chosen in each species of *Plantago* raised in every soil type. In this process first of all the total number of pollen grains was counted in per unit area and than differentiated into fertile and sterile pollen grains by which the pollen fertility percentage (% age) was evolved. The main different between sterile and fertile pollen grains was that the fertile pollens easily stained in acetocarmine and smooth walled while the sterile pollens were not easily stained and its walls were also wrinkled. The data was again statistically analysed.

Result and Discussion

The diameter of definite number of pollen grains was recorded with the help of stage micrometer and occular. The scoring was alone on 5 to 7 plants randomly from each soil.

In the case of *P.ovata* the mean value of fertile pollen diameter were recorded as 24.54µm, 23.722µm, 22.904µm and 22.08µm in control, organic, sand and usar soil respectively. While the diameter of sterile pollen was recorded as 22.09µm, 21.26µm, 22.08µm and 22.08µm in control, organic sand and usar soil respectively. The maximum diameter of fertile pollen was recorded in control and minimum was recorded in usar soil while the maximum diameter of sterile pollen was recorded in control and the minimum was recorded in organic soil Table-1 (Plate-1).



In the case of *P.lanceolata* the mean size of fertile pollen were recorded as 13.90µm, 17.99µm, 19.63µm and 14.72µm in control, organic, sand and usar soil, respectively while the mean size of sterile pollen were recorded as 13.08µm, 17.17µm, 17.99µm and 13.90µm in control, organic, sand and usar soil, respectively. The maximum diameter of fertile pollen recorded in sandy soill while the minimum was recorded in control soil and likewise the maximum diameter of sterile pollen was recorded in sandy soil while the minimum in control. (TABLE-1), (Plate-1).

In the case of *P.coronopus* the mean diameter of fertile pollen were recorded as 25.35µm, 26.99µm, 22.90µm and 25.35µm in control, organic, sand and usar soil, respectively, and the mean value of diameter of sterile pollen were recorded as 19.63µm, 22.08µm, 17.99µm and 23.72µm in control organic, sand and usar soil respectively. The maximum diameter of fertile pollen was recorded in organic soil while the minimum was recorded in the sandy soil while the mean diameter of sterile pollen was maximum

in usar soil and the minimum was record soil. (Table-1), (Plate-1)

The pollen fertility percentage was also recorded in each species in different soil conditions.

In *P.ovata,* the fertility percentage were recorded as 88%, 82.19%, 82.51% and 75.83% in control, organic, sand and usar soil respectively. The maximum was recorded in control soil while the minimum was recorded in the usar soil (Table-2), (Plate-1).

In *P.lanceolata,* the fertility Percentage wererecorded as 83.82%, 85.6%, 74.78% and 76.3% in control, organic, sand and usar soil, respectively. The maximum fertility was recorded in organic soil while the minimum was recorded in sandy soil (Table-2) (Plate-1).

Likewise, in *P.coronopus* the fertility percentage was recorded as 88.28%, 85.36%, 75.0% and 78.99% in control, organic, sand and usar soil respectively. The maximum fertility was observed in control soil while the minimum was recorded in sandy soil (Table-2) (Plate-1).

The studies on the possible effect of different soil types on pollen shape, size and fertility, clearly indicated that the size of pollen grains remained unaffected in different soil types in case of *P.ovata* and *Plantago coronopus* but there was a clear cut indication that in *P.lanceolata* the pollen diameter was considerably increased under the influence of organic soil and sandy soil. Through the diameter of fertility and sterile pollen grains remained almost similar in all *Plantago* species under changed soil conditions but there was an indication that the organic and sandy soil might have favored the pollen diameter positively. As surveyed by Cerceau (1959) and Ting (1961) that the pollen of treated plants showed great diversity of the shape and size of pollen grains, it was on attempt to work out that wheather the changed soil conditions can affect the pollen shape and size or not.

The changed soil conditions adversely affected the fertility of the pollen in all the three *Plantago* species. All the species displayed a considerable decrease in pollen fertility under changed soil conditions.

This, it can be concluded that any change in existing edaphic factor, may provide an, effective stimulus for reducing the fertility. This is an indication for chromosomal abnormalities, which are the ultimate, source of variation.

Table-1

Effect of different soil type on pollen size in different *Plantago* species.

TYPE OF SOIL	*P. ovata*		*P.lanceolata*		*P. coronopus*	
	Mean size of fertile pollen x̄ (µm)	Mean size of sterile pollen x̄ (µm)	Mean size of fertile pollen x̄ (µm)	Mean size of sterile pollen x̄ (µm)	Mean size of fertile pollen x̄ (µm)	Mean size of sterile pollen x̄ (µm)
CONTROL SOIL	24.54	22.09	13.90	13.08	25.35	19.63
ORGANIC SOIL	23.722	21.26	17.99	17.17	26.99	22.08
SANDY SOIL	22.904	22.08	19.63	17.99	22.90	17.99
USAR SOIL	22.08	22.08	14.72	13.90	25.35	23.72

Table-2

Effect of different soil type on pollen fertility in different *Plantago* species.

TYPE OF SOIL	*P. ovata*		*P.lanceolata*		*P. coronopus*	
	Percentage of Fertile pollen (%)	Percentage of sterile pollen (%)	Percentage of Fertile pollen (%)	Percentage of sterile pollen (%)	Percentage of Fertile pollen (%)	Percentage of sterile pollen (%)
CONTROL SOIL	88	12.0	83.82	16.17	88.28	11.55
ORGANIC SOIL	82.19	17.80	85.6	14.4	85.36	14.63
SANDY SOIL	82.51	17.48	74.78	25.21	75	25
USAR SOIL	75.83	24.16	76.3	23.6	78.99	21.00

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