Research Note

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Effect of fluoride toxicity on sterility behaviour of wheat (*Triticum aestivum* L.)

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ABSTRACT : Four varieties of wheat WH-711, HD-2932, PBW-502 and DBW-17 were tried for pollen and ovule sterility behavior. The five concentrations of NaF 10, 25, 50, 100 and 200 ppm were sprayed fortnightly on wheat plants upto maturity. Four replications were considered. The comparison was done with control. The results were found significant. Pollen sterility and ovule sterility were found minimum in control plants while maximum sterility percentage was recorded in 200 ppm dose of NaF.

Key Words : Sterility of pollen and ovule, Iodine solution, Wheat varieties, Microscope, Glass slide

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According to Odum (1971) pollution is an undesirable change in the physical, chemical or biological characteristics of air, land and water that may or will waste or deteriorate our raw material resources. Pollution is of two types *viz.*, non-degradable pollutants and degradable pollutants, on the basis of environment e.g. air, water, soil and noise pollution.

Sterility shows the inability to produce viable off springs (Hays, Immer and Smith, 1955). The increase in sterility was due to several causes. Such sterility may be caused either by inactivation of certain genes by deletions of terminal segments containing fertility genes. Sterility due to chromosomal aberrations has been reported by Weinstein *et al.* (1959) and Weistein (1961). Ehrenberg *et al.* (1961), Heiner *et al.* (1960) and Froese-Gartzen (1962). The variations in pollen sterility due to translocation were observed in different crop plants by Burnham (1948), Burnham *et al.*, (1954) and Shieh and Shebesky (1960) in pea (*Pisum sativum* L.). Gottschalk (1968) observed variation in sterility due to interchanges. The sterility induced by NaF is most probably caused by deficiencies during structural changes in chromosomes.

Four varieties of wheat (*Triticum aestivum* L.) WH-711, HD-2932, PBW-502 and DBW-17 were obtained from I.A.R.I., New Delhi. For the pollen sterility studies the sporocites (spikelets) of wheat varieties were collected in 70% alcohol. Pollen sterility was determined by disecting the anthers of wheat. A drop of 1% Iodine solution was used for study.

Pollen grains were counted under 100X magnification of the microscope. The counts were made for each treatment with the preparation of temporary slides and an average of ten observations were taken. Fertile pollen grains stained more than half while those with no stain or stained less than half were considered to be sterile.

Ovule sterility studies :

In wheat (above four varieties) non-formation of grain in spikelets was taken as a criteria for ovule sterility. The number of empty grains in spikelets were counted and their percentage was calculated.

Effect of NaF on sterility behavior :

Pollen sterility percentage :

Pollen sterility percentage was affected in all the four varieties of wheat *viz.*, WH-711, HD-2932, PBW-502 and DBW-17 due to NaF toxicity. 200 ppm showed maximum pollen sterility percentage in comparison with control plants of four varieties of wheat (Table 1).

Ovule sterility percentage :

Ovule sterility percentage was also affected in all the four varieties of wheat (*Triticum aestivum* L.) due to NaF toxicity. 200 ppm plants showed maximum ovule sterility, while control plants showed minimum ovule sterility percentage (Table 1). Empty spikelets of wheat were taken as the criteria for counting the sterility percentage.

The increase in sterility was due to several causes. Such

Table 1 : Effect of NaF on pollen and ovule sterility percentage of wheat (*Triticum aestivum* L.)

NaF Concentrations	Pollen sterility percentage of wheat varieties			
	WH-711	HD-2932	PBW-502	DBW-17
Control	2.23	2.28	2.30	2.33
10 ppm	2.40	2.45	2.47	2.58
25 ppm	4.73	4.81	4.85	4.97
50 ppm	8.54	8.61	8.63	8.88
100 ppm	12.74	12.82	12.87	13.06
200 ppm	26.10	26.36	26.51	26.93
NaF Concentrations	Ovule sterility percentage of wheat varieties			
	WH-711	HD-2932	PBW-502	DBW-17
Control	1.3	1.5	1.7	1.8
10 ppm	2.3	2.6	2.8	2.9
25 ppm	3.7	3.8	4.0	4.3
50 ppm	10.2	10.5	10.8	11.1
100 ppm	18.4	18.9	19.3	19.8
200 ppm	29.8	30.3	30.8	31.1

sterility may be caused either by inactivation of certain genes or by deletions of terminal segments containing fertility genes. Sterility due to chromosomal aberrations has been reported by Ehrenberg *et al*. (1961), Arya (1971) and Heiner *et al*. (1960). The variations in pollen sterility due to translocation were observed in different crop plants by Burnham (1948), Burnham *et al*. (1954) and Shieh and Shebesky (1960). Pollen and ovule sterility behavior has been reported in various crop plants by Arya (1971), Arya and Rao (1978 and 1980), Nimesh (2001), Chaudhry (2004), Rawat (2005), Neeru (2011) and Singh, (2013).

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