ISSN : 2456-1363

International Journal of Scientific Research & Growth

A multidisciplinary journal for empowering the research

Studies On The Effect Of Sodium Fluoride On Growth Parameters Of *Brassica Campestris* L.

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Abstract

Growth parameters in *Brassica campestris* L. plants grown in soil supplemented with sodium fluoride (50, 100, 200 and 400 mg/kg.) was under taken. The plants grown in the soil with the addition of higher concentration of NaF exhibited a marked reduction in growth parameters (seedling germination length of root, shoot, plant height, number of leaves, size of leaf, number of flowers per plant, fruit set percentage and seed set percentage) as compored to control plants.

Keywords : Growth parameter, NaF, *Brassica campestris* L.

Introduction

Fluoride at higher concentrations is known to cause several health hazards. It is known that fluoride when taken up by plants is likely to prove toxic. Fluoride affects a wide range of physiological and biochemical processes. (Wang *et al.*, 1995 and Nagoor, 1997)In the Agra region ground water is known to have elevated levels of fluoride (Gupta *et al.* 1999). Moreover, *Brossica campestris* L. is very popular crop of Agra region and is widely affected by the toxicity of fluoride. Hence, a study was conducted on the effect of fluoride on the growth parameters of *Brossica campestris* L. at Agra.

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Materials And Methods

A field experiment was conducted during 2011 – 2013 with *Brassica campestris* L. seeds (collected from the Division of genetics, I.A.R.I., New Delhi) at Botanical garden, Agra College, Agra in microplots of 1.5m x 1.5m containing loam soil (pH 7.8, ECF 1.5 ds/m, available N 150 kg/ha, P 15 kg/ha, K 225 kg/ha, organic carbon 0.15%, soluble cations 15.01 me/1, soluble anions 15.01 me/1, $CaCO_3$ 0.8%). Each microplots was separated by polythene line upto 60 cm depth. Between two microplots a bund of 0.5 m was left. The treatments were replicated thrice. The seeds were sterilized and then soaked for a period of 24 hours in distilled water. Sodium fluoride (NaF) was added @50, 100, 200 and 400 mg/kg soil (dry wt) in different microplots. For control, NaF was not added in alternate microplots between the ones supplemented with NaF. The seeds were sown in these microplots in respective years. The crop was raised to maturity by irrigation with distilled water. Observations of different growth parameters were recorded and statistically analyzed.

Results and Discussion

It is clear from the data of the Table 1 that *Brassica campestris* L. plants growth in soil supplemented with various levels of NaF (50, 100, 200 and 400 mg/kg in soil) exhibited a marked reduction in growth parameters i.e. seedling germination percentage, length of root, length of shoot, plant height, number of leaves, size of leaf, number of flowers per plant, fruit set percentage and seed set percentage as compored to control plants. Also the plants of *Brassica campestris* L.grown in the soil with the higher concentration of NaF (400 mg/kg soil) showed maximum reduction in their growth parameters as compored to control plants.

Similar to the present study, earlier studies confirm that fluoride cause reduction in several morphological, physiological and biochemical parameters.(Posthumus, 1983; For nasiero, 2001, 2003; Elloumi *et. al.*, 2005; Sabal and Khan, 2006 and Reddy and Kaur, 2008). Wang *et. al.* (1995 and Nagoor(1997) have also reported the inhibition of root, shoot and leaf elongation by sodium fluoride treatments.

Present findings are also supported by Sing et. al. (1978 a and b), Pant (1997) and Gupta et. al. (2009). According to them fluoride presented the dephosphorylation of ptylin compound in the plant tissue and retarted the rate of seedling growth during germination. Shaddad *et. al.* (1989) have also supported adverse effect of NaF on seedgermination, transpiration rate and growth parameters in *Helianthus annus*, *Zea mays* and *Vicia faba* L. The results are also supported by the view that fluoride induces metabolism disorders resulting in the reduction in Crop field

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(Weinsten, 1961). The reduction in yield of plants grown in higher concentration of NaF can also explained by the fact that fluoride causes cytological disorders (Gritsan NP, 1993) which may be the cause of pollen sterility

Table 1 : Morphological parameters in *Brassica campestris* L. plants treated with different concentration of NaF.

S. No.	Parameters	NaF (Mg/Kg) soil				
		Control	50	100	200	400
1	Seedling germination %	98.2 ± 2.32	94.60 ± 1.08	92.18 ± 1.04	89.27 ± 1.00	87.12 ± 0.94
2	Length of root after 45 days (cm)	24.42±2.70	21.18±1.90	18.78±1.66	14.32±1.40	11.42±1.14
3	Length of shoot after 45 days (cm)	30.78±2.90	27.52±2.22	23.74±1.98	18.41±1.42	13.76±1.12
4	Plant height after 45 days of germination (cm)	51.65±4.05	48.74±3.34	42.52±2.75	37.24±2.18	33.52±1.75
5	Number of leaves	18.24±1.08	17.45±1.84	16.17±1.37	14.49±1.52	10.42±1.31
6	Size of the leaf (cm)	21.25 ± 1.99	20.44 ± 2.04	19.08 ± 1.93	18.65 ± 2.01	17.85 ± 2.11
7	Number of flower/plant	710	690	620	550	445
8	Fruit set %	89.2±2.32	83.4±2.01	70.8±2.20	64.6±1.88	45.9±1.50
9	Seed set %	96.1±1.78	88.38±1.88	77.7±1.70	68.47±1.27	53.40±2.4

Mean value ± SD

ISSN : 2456-1363
International Journal of Scientific Research & Growth
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References

1. Elloumi N., Abdallah F.B., Mezghani I., Rhouma A., Boukhris M. and Tunisia S.; 2005. Effect of fluoride on almond seedling in culture solution. *Fluoride*, **38(3):** 193 – 8.
2. Fornasiero R.B.; 2001. Phytotoxic effects of fluoride. *Plant Science*, **161:** 979 – 985.
3. Fornasiero R.B.; 2003. Fluorides effect on *Hypersicum perforatum* plants: First field observations. *Plant Science*, **165:** 507 – 513.
4. Gritsan NP, 1993. Cyto genetic effect of gaseous fluorides on grain crops. Fluoride **38(3):** 193-198.
5. Gupta M.K., Singh V., Rajvanshi P., Agarwal M., Rai K., Srivastava S., Srivastava R. and Dass S.; 1999. Ground water quality assessment of Tehsil Kheragarh, Agra (India) with special reference to fluoride.
6. Environmental monitoring and assessment. **59:** 275 – 285.
7. Gupta S., Banerjee S. and Mondal S.; 2009. Phytotoxicity of fluoride in the germination of paddy (*Oryza sativa*) and its effect on the physiology and biochemistry of germinated seedlings. *Fluoride* **42 (2):** 142– 6.
8. Nagoor S.; 1997. Fluoride – induced alternations in growth and metabolic activities in maize seedlings. *J. Phytol Res*., **10:** 47– 50.
9. Pant S.; 1997. Studies on the effect of sodium fluoride on seed viability, seedling growth of grain crops, and cytology of root apices of *Allium cepa*. L. [thesis]. Prasanthinilayam (India): Sri Sathya Sai Institute of Higher Learning.
10. Posthumus A.C.; 1983. Higher plants as indicators and accumulators of gaseous air pollution. Environmental Monitoring and Assessment, **3:** 263 – 272.
11. Reddy M.P. and Kaur M.; 2008. Sodium fluoride induced growth and metabolic changes in *Salicornia brachiata* Roxb. *Water Air Soil Pollut*, **188:** 171 – 179.

ISSN : 2456-1363
International Journal of Scientific Research & Growth
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12. 12.Sabal D, and Khan T,I, 2006. Effect of sodium fluoride on Cluster bean (*Cyamopsis tetragonoloba*) seed germination and seedling growth, fluoride, **39:** 228-230.

13. Shaddad M.A., Radi A.F. and El-Enamy A.E.; 1989. Seed germination transpiration rate and growth criteria as affected by various concentrations of $CdCl_2$, NaF and 2,4-DNP. *J. Isl. Acad. Sci*. **2(1):** 7 – 12.

14. Singh A., Chhabra R. and Abrol I.P.; 1978a. Effect of fluorine and phosphorus on the yield and chemical composition of Rice (*Oryza sativa*) grown in soils of two sodicities. *Soil Science*. **127:** 86 – 93.

15. Singh A., Chhabra R. and Abrol I.P.; 1978b. Effect of fluorine and phosphorus applied to a sodic soil on their availability and on yield and chemical composition of wheat. *Soil Science* **128:** 91 – 97.

16. Wang Y.Z., Zhou Y. and Zylstra G.J.; 1995. Molecular analysis of isophosphate and tetraphosphate degradation by common testosteroni YZW-D. Environ health Perspect. **5:** 9 – 12.

17. Weinstein L.H.; 1977. Fluoride and plant life. *Journal of Occupational Medicine*, **19:** 49 – 78.