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Gametocidic effect of heavy metal (Cadmium chloride) on *Vigna unguiculata*

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SUMMARY

The treatment of the lowest concentration (10 mg/ml) of cadmium chloride showed 89.00±1.30, 70.80±3.66, 65.80±2.83, 60.00±3.27% pollen fertility in F, F-24, F-48, F-72 series of *Vigna unguiculata* respectively, while the treatment of the highest concentration (500 mg/ml) of the heavy metal which showed flowering produced 60.00±1.41, 51.00±2.58, 47.00±3.60, 40.00±3.09% pollen fertility in F, F-24, F-48, F-72 series respectively. This proves the gametocidic behaviour of the heavy metal.

Key words : Plant Breeding, Crop Physiology, Heavy metals, Toxicology, Genetics.

Cadmium is invariably associated with zinc in oars. Almost all zinc minerals contain cadmium in amounts from 0.2 to 0.5%. Hence cadmium is always extracted from zinc ores. There is general agreement that cadmium in the environment is a real and present hazard to human health. Cadmium is released into the air as a result of incineration or disposable of cadmium containing products *e.g.* rubber tiers , plastic containers and as a byproduct in the refining of other metals, primarily zinc. Cadmium toxicity in animals is well known (Prodan, 1932).

MATERIALS AND METHODS

Certified seeds of *Vigna unguiculata* (L.) Walp. Var. Pussa barsati (Cowpea) of Delhi were obtained from the authorized dealers from which healthy seeds were selected. To study the effect of cadmium, 20 seeds of *V. unguiculata* were sown in white-transparent polythene bags (35C25 cm) containing soil. After sowing the seeds bags were watered on every alternate day for the first 7 days and then the treatment of cadmium chloride was given. Each bag was watered with 500 ml different concentrations *i.e.* 10, 50, 100, 500, 1000 mg/ml the heavy metal. The treatment was given on every alternate day till the end of the life-cycle of the crop. A set of control crop was also grown simultaneously with only water in the same quantity as the treated crop. Excess seedlings were removed after 15 days of sowing leaving the identical and healthy 5 seedlings in each bag. There were 10 replicates of each treatment. The observations regarding mortality were recorded on every alternate day. After 2 weeks of an uniform flowering successive flowers (*viz.* F, F-24, F-48, F-72 series *i.e.* open flowers and the flower buds which require 24, 48, 72 hours to open respectively.) were plucked at the same time after the dehiscence of anthers (in open flowers). Pollen viability was ascertained by using 2,3,5-Triphenyl tetrazolium chloride (Hauser and Morrison, 1964). For each experiment a random count of 100 grains was made (from different fields on the slide) to determine the pollen viability. The data obtained is statistically analyzed applying 't' test. Percentage inhibition (-) was also determined.

RESULTS AND DISCUSSION

The treatment of the highest concentration of cadmium chloride caused cent percent mortality of *Vigna unguiculata* after 19 days of treatment (Table 1). Control crop started flowering after 53 days of sowing, while the treated crop with 10, 50, 100, 500 mg/ml cadmium chloride started flowering after 50, 45, 44, 43 days of sowing respectively. The treatment of the lowest concentration (10 mg/ml) of cadmium chloride showed 89.00±1.30, 70.80±3.66, 65.80±2.83, 60.00±3.27% pollen fertility in F, F-24, F-48, F-72 series of *Vigna unguiculata* respectively, while the treatment of the highest concentration (500 mg/ml) of the heavy metal which showed flowering produced 60.00±1.41, 51.00±2.58, 47.00±3.60, 40.00±3.09% pollen fertility in F, F-24, F-48, F-72 series respectively. This proves the gametocidic behaviour of the heavy metal. Salgare and Suwarna Gawde (1991) recorded the gametocidic effect of heavy metal on the leguminous crop. Gametocidic effect of various herbicides was noted by Salgare (1986c, d, 87, 92, 99d, e, 2005b, d), Salgare and Ram Indar (2005), Salgare and Sharma (2005) and Salgare and Theresa Sebastian (2005a, b) in their extensive work. However, none of the treatments could bring down the pollen fertility to zero per cent which is necessary for successful plant breeding programmes (Table 1).This proves that the chemical induction of pollen sterility fails here which is now-a-days used for plant breeding programmes.

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