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Effect of glyphosate on linear growth of seedlings and their morphological characters of *Hibiscus cannabinus* Linn.

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ABSTRACT

Uniform seedlings were treated with different concentrations of glyphosate for 24 hours. Then they were thoroughly washed with distilled water and kept for germination in petridishes containing double layered filter paper at room temperature for 72 hours. The effect of herbicide on liner growth of hypocotyl and radicle was noted. Glyphosate was effective in checking the linear growth of seedlings. This herbicide inhibited the linear growth of seedlings and caused swelling. The radicle was found to be more succeptible than hypocotyl. The lethal dose was found to be 600 ppm for hypocotyl and 500 ppm for radicle. The seedlings showed some morphological changes like inhibition of lateral roots formation and color of seedlings changed from green to yellowish observed due to application of glyphosate.

Key words: Herbicide, Glyphosate, Linear growth, Morphological characters, *Hibiscus cannabinus* Linn.

INTRODUCTION

A large number of seeds of *Hibiscus cannabinus* Linn. were allowed to germinate in petridishes containing double layered filter papers at room temperature. When the seedlings attained the length of 7 to 10 mm, the seedlings of uniform length were selected for herbicidal treatment.

Each set of 10 seedlings was treated with different concentrations of herbicide ranging from 100 to 2000 ppm for 24 hours. Lower concentrations were used, where it was found to be higher dose. After treatment the seedlings were thoroughly washed with distilled water and allowed to grow for 74 hours in petridishes containing moistened filter papers. After 72 hours, the length of hypocotyl and radicle was measured separately in each seedling. The seedlings soaked in distilled water for 24 hours were used as control. Three replicates of each treatment were carried out.

Morphological abnormalities were recorded. The actual increase in the length of hypocotyl and radicle has been graphically presented on the basis of mean values of three replicates. The pH of control and solutions of herbicide was also determined by pH meter.

RESULTS

Glyphosate was found to be effective. There was gradual decrease in length of hypocotyl and radicle with increases in the concentrations of herbicide. Thus, the length of hypocotyl was 6.0, 5.0, 4.0, 2.7, 1.0 and 0.0 mm at 100, 200, 300, 400, 500 and 600 ppm, as against 13.33 in control. Similarly, decreases in the length of radicle were 3.9, 2.7, 1.33, 0.41 and 0.0 mm at 100, 200, 300, 400, 500 and 600 ppm as against 8.0 mm in control (Table 1, Fig. 1). The lethal dose for hypocotyl and radicle was 600 and 500 ppm, respectively.

Table 1: Showing effects of glyphosate on linear growth (in mm) of hypocotyl and radicle of *Hibiscus cannabinus* Linn.

Herbicide	Concentrations (ppm)	Length of Hypotoctyl (mm)	Standard Error(+)	Length of Radicle (mm)	Standard Error(+)
-	Control	13.33	1.46	8.0	2.0
Glyphosate	100	6.0	2.0	3.9	2.26
	200	50.	6.0	2.7	0.45
	300	4.0	0.57	1.33	0.12
	400	2.7	0.33	0.41	0.04
	500	1.0	0.0	0.0	-
	600	0.0	-	-	-

The Glyphosate treated seedlings showed some morphological abnormalities such as changes in colour from green to yellow and slight rotteeing, which is progressed towards hypocotyl. Inhibition of lateral roots formation was observed in all treated seedlings at all concentrations of herbicide (Fig. 2 and 3).

DISCUSSION

This herbicide was found to be effective in controlling linear growth of seedlings. The suppression of growth was observed in the seedlings due to application of glyphosate. Many workers observed inhibitory effects on seedlings of various weeds. Klingman and Murray (1976) on *Poa paratensis, Festuca rubra* and *Festuca arundinacea* reported stunted growth of seedlings by following glyphosate treatment. Gill *et al*. (1986) on *Cyperus rotundus* observed that the buds and tubers did not grow further and root growth was inhibited. Similar results were reported by Jain (1993) on *Chenopodium album*, Bobde (1993) on *Crotalaria juncea* and Kulkarni (1993) on *Crotalaria medicaginea* var. *luxurians* due to application of glyphosate.

In present study, glyphosate treated seedlings observed change in its colour from green to yellow. It might be due to lack of chlorophyll formation due to application of herbicide. Hammerton (1975) on *Cyperus rotundus* observed that the glyphosate treated seedlings showed chlorosis within three days of treatment. Klingman and Murray (1976) on turf grass reported some chlorotic symptoms. Uotila *et al*. (1980) on *Sinapsis alba* reported chlorosis in seedlings, which was caused due to decreases in chlorophyll contents. Jain (1993) on *Chenopodium album*, Bobde (1993) on *Crotalaria juncea* and Kulkarni (1993) on *Crotalaria medicaginea* var. *luxurians* observed chlorosis and necrosis due to application of glyphosate.

In present study, the length of radicle was more suppressed than hypocotyl. This may be due to the radicle growth was associated with cessation of cell division in the meristematic region. Similar results were reported by Klingman and Murray (1976) on turf grass, Tanphiphat and Appleby (1990) on *Arrhenathrum elatius,* Bobde (1993) on *Crotalaria juncea* and Kulkarni (1993) on *Crotalaria medicaginea* var. *luxurians* due to application of glyphosate.

The range of pH from control to 600 ppm solution of herbicide was 7.0 to 5.8, respectively i.e. solution become more acidic with the increase in

concentrations of herbicide. Therefore, it may be concluded that the linear growth of hypocotyl and radicle decrease with the increase in concentrations. This is according to the finding Audus (1949).

From the foregoing discussion it was concluded that glyphosate inhibited the linear growth of seedlings. The radicle was more susceptible than hypocotyl.

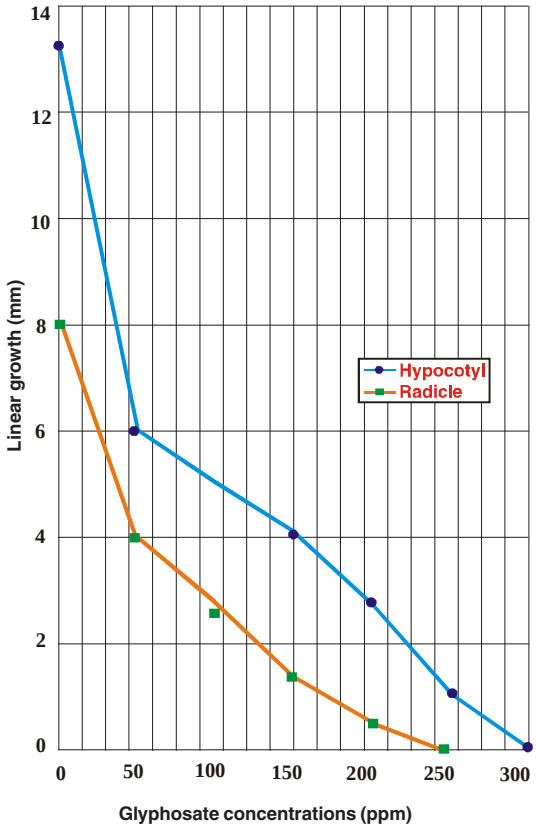

Fig. 1: Graph Showing decrease in the linear growth of hypocotyl and radicle of seedlings following glyphosate treatment

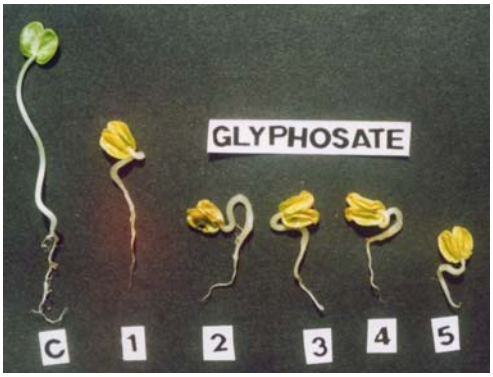

Fig. 2: C - Control seedling. 1 to 5 - Seedlings at 200, 300, 400, 500 and 600 ppm of glyphosate, respectively.

Fig. 3: Control seedling. 5 - Seedling at 600 ppm of glyphosate.

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