

A Study on Macromolecular Protein Synthesis Affected By Agrochemical 2, 4-D In Seedling of Weed *Hyptis Suaveolens* L.

Dudhe S. S., Khirade P. D.* and Dudhe N. S.

Department of Botany, Guru Nanak College of Science, Ballarpur, Chandrapur, Maharashtra, India

*Corresponding Author Email-pramodkhirade@gmail.com

Abstract: Agrochemical 2, 4-Dichlorophenoxy acetic acid (2,4-D) is an unintentionally toxic substance. The most obvious side effects of this toxicant are more or less macromolecular synthesis of protein content in weed plant *Hyptis suaveolens* L. In this investigation seeds of *Hyptis suaveolens* L. were treated with different concentration of agrochemical 2,4-D at room temperature for 24 hours and allow to grow in petri dishes. Seedling protein profile content were analyzed; the result indicate that 2,4-D reduces the protein content of seedlings gradually from lower to higher concentration as compare to control.

Keywords: *Hyptis suaveolens* L., seedlings, 2,4-D, macromolecular protein synthesis

I. INTRODUCTION

A weed is a plant growing where it is not desired. It interferes with the utilization of land and water resources that affects human and animal welfare. The natural growth aggressiveness and high adaptability of weed always makes them winners in the competition race which leads to high crop loss. Thus it is a very necessity to control the weed. The most popular method to check the growth of weed is the application of herbicides. Among various herbicides 2, 4-Dichlorophenoxy acetic acid (2,4-D) is a extensively tested for health and safety, low-cost and effective weed controller. It effectively controls weeds at early emergence, seedling staged weeds and broad leaf weeds growing in between rows of crops.

Application of 2,4-D affects various metabolic activities of the plant at seedling stage including synthesis and content protein DNA, RNA, Lipid, carbohydrates etc. A number of investigations had showed that application of agrochemicals alter the protein content of the cell (Ebad *et al.*, 1993; Soliman and Ghoneam, 2004). Early 2,4-D is considered as synthetic auxin (Zimmerman and Hitchcock, 1942) but latter on Hamner and Tukey (1946) proved that 2,4-D is herbicide. In the present investigation effect of various concentrations of 2,4-D application on protein synthesis and content in the seedling of weed *Hyptis suaveolens* L. was studied.

II. MATERIAL AND METHODS

In this investigation plant species *Hyptis suaveolens* L. belonging to family Lamiaceae was utilized. *H. suaveolens* L. is a weed found growing luxuriantly on boundary of crop fields, on sides of railway tracks and road sides in Maharashtra especially in vidarbha region. The seeds of plant were collected from mother plants growing in fields. The seeds were treated with different concentration of 2, 4-D (2,4-Dichlorophenoxy-acetic acid) like 10-200 ppm for 24 hours and in distilled water for control. The treated and control seeds were washed thoroughly with distilled water and kept for germination in petridishes lined with moistened double layer filter paper under laboratory conditions. The treated and untreated seeds allowed growing for seven days. The Morphological responses of growing seedlings were recorded daily. The treated and control seedlings sample containing 1 gm of seven day's old were taken for isolation and estimation of protein concentration. The four replicates were used for each sample at each concentration of agrochemical 2,4-D. The extraction and estimation of protein was carried out by Lowry's *et al.* method (1951).

III. RESULT

The results obtained after the treatment of 2, 4-D (2, 4-Dichlorophenoxy-acetic acid) show morphological changes in seedlings at all concentration (Fig.1). The gradual decrease in the percentage of germination as well as protein concentration was observed with the increase in the concentration (Fig.1 and Table 1).

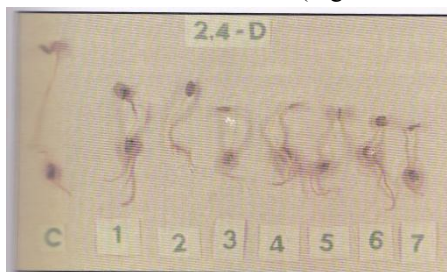


Fig:1 Seedling showing morphological changes

Table 1: Table showing protein per gram seedling at different concentration of 2,4-D.		
Agrochemical	Concentration in ppm	Microgram per gram seedling
	Control	16.8
2,4-D	10	18.750
	20	18.750
	40	15.625
	60	14.750
	80	14.375
	100	12.500
	200	9.375

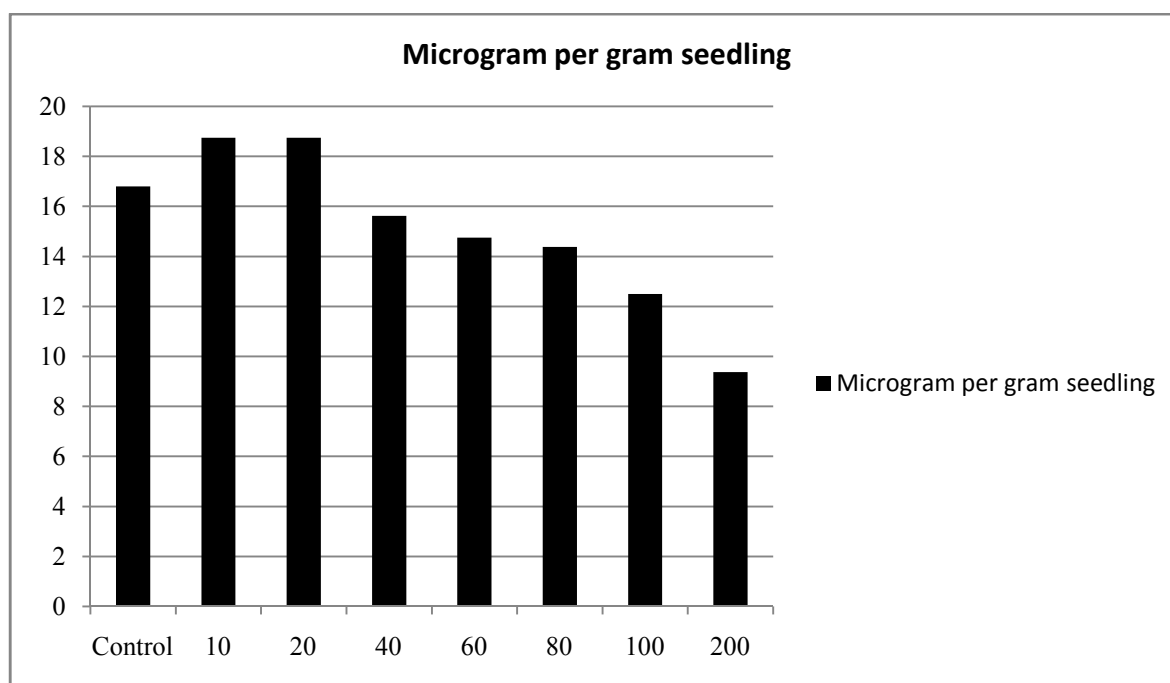


Fig. 2: Graph showing protein per gram seedling at different concentration of 2,4-D.

The percentage of protein concentration at 10, 20, 40, 60, 80, 100 and 200 ppm was 18.750, 18.750, 15.625, 14.750, 14.375, 12.500 and 9.375 respectively as against 16.8 at control (Table: 1 and Fig. 1). The % of protein content decreased abruptly at 80 ppm, and it was negligible at above 200 ppm. Some morphological responses of the seedlings as follows- Growth of hypocotyls and radical was normal at 10 ppm, but however, above 20 ppm the growth stunted,

swollen and twisting of hypocotyls occurred at lower dose (Fig.1). As the concentration of agrochemical 2, 4-D increases, decrease in the percentage of germination was observed and steep fall in germination was seen in 80 ppm.

IV. DISCUSSION AND CONCLUSION

This study was carry out to find the effect of agrochemical 2,4-D (2,4-Dichlorophenoxy-acetic acid) on protein content in 2,4-D treated seedlings. The results reveals that protein content of the seedlings decreases as the concentration of 2,4-D increases. According to Mathur *et. al.*, (2006) agrochemicals brought morphological changes in seedlings. Changes in the nitrogen content of seedlings were observed due to application of 2,4-D. Stahler and Whitehead (1950), Frieborg and Clark (1952), Berg and MC Elory (1953) Key *et. al.* (1966), Kumar and Singh (2010) and Sanjay Kumar (2012) studied the protein synthesis in apical zones of hypocotyls following 2, 4-D treatment and noted blockage of protein synthesis in soybean. Kolhe (1979), noted decrease in the protein content of *Solanum surattens* following 2,4-D application. Srinivasu 1988, observed gradual decrease in protein content of *Parthenium hysterophorus* seedlings. Jain 1993, reported decrease in protein content after treatment of 2,4-D on *Chenopodium album*. Gopal 1993 in *Medicago sativa*, Kulkarni 1998, in *Crotolaria medicaginea* and Tulankar 1998, in *Amaranthus lividus* were reported that the protein content affected by application of 2,4-D. Mhaiskar M.N. (2021) reported gradual decrease in the protein content of *Sida acuta* seedlings.

The sudden decrease in germination percentage and protein content noticed in present study at 80 ppm concretion of 2,4-D. it is probably due to the failure of metabolism of seed reserve (Sasaki and Kozlowski, 1968).and (Tulankar,1998) at 600 ppm have also noticed in *Amaranthus lividus* L. By above discussion it can be concluded that 2,4-D worked as inhibitory agent on protein synthesis and seed germination this might be due to phototoxicity, interfering the metabolic activity , which control the emergence of radical. 2,4-D also affect on the cell division and cell elongation, which ultimately result in the decrease in protein content and length of seedling.

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