INFLUENCE OF GA ON SEEDLING GROWTH OF *LEUCAENA LEUCOCEPHALA* (LAMK.) DE WIT." CULTIVARS

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Effect of different concentrations (50,100,200,500 ppm) of GA was studied on seedling growth and development in eleven cultivars (Peru, Pirasicana, Campena grandi, Gum variety, K-28, MU, FG-3, FG-6, FG-9, K-8 and FG- 13) of *Leucaena leucocephala*. to find out the inhibitory concentration for different seedling parts . Appreciable reduction in seedling growth was observed in Peru, CG, K-8, FG-9 & FG-13 cultivars specially in 200 and 500 ppm. Higher than physiological concentrations of Plant growth Regulators (PGRs) specially GA may be beneficial in controlling weeds as *Leucaena leucocephala*.

Key words: *Leucaena*, GA, Seedling, Growth

Growth regulators are known to enhance or decrease growth of seedlings differently in different parts of the same and different cultivars (Vimala 1985). *Leucaena leucocephala* was once upon a time preferred for social forestry due to its timber and nutritious properties (Gray 1968, Blom 1981, Chaturvedi 1981,83, Krishnamurthy 1981, Brewbaker 1982, Minu 1986,88,89). However, during the course of time it was established as an abnoxious weed. Hence, measures to control the growth of this tree were emphasized and in this light a growth regulator Coumarin (COU) was tried (Minu, 2010) with mixed results on this plant. Kinetin as a growth promoting PGR has also been recorded to result into inhibition of seedling growth by all concentrations (10,25,50,100 ppm) used in a study on the CG, FG-13,K-8 and K-28 cultivars of *Leucaena leucocephala* (Minu 1990). Thus, soil friendly growth regulator Gibberellic Acid (GA) was also tried to identify higher concentrations than the physiological concentration, as same growth regulator can inhibit growth beyond physiological concentration.

MATERIALS AND METHODS

Seeds of 10 out of 11 cultivars of *Leucaena leucocephala* were procured from Bharatiya Agro Industrial Foundation, Pune and 1 cultivar from the CCS University, Meerut. The procedure followed was similar to that, in previous experiment with COU (Minu 2010). Different concentrations of GA (50, 100, 200 and 500 ppm), were used for soaking the seeds. The seedling parameters such as length of seedling parts, number of lateral roots, fresh and dry weight were recorded on 7th day after radicle emergence.

RESULTS

1.Length of Radicle (Fig.1, Tab.1): Promotion was observed in all the four concentrations in Pirasicana, with the highest value 6.78 cm in 500 ppm (5.89 cm in control). In Gum variety, FG-13 and K- 28 beyond 200 ppm, in MU and FG-9 beyond 100 ppm was recorded to be inhibitory as compared to control. Besides Campena grandi exhibited reduction beyond 50 ppm. All the concentrations used were significantly inhibitory in variety Peru.

2.Length of Hypocotyl (Fig.1, Tab.1): FG-3 and Campena Grandi exhibited promising inhibition of hypocotyl length in 500 ppm GA.

3.Total Length of Radicle and Hypocotyl (Fig.1, Tab.1): FG-3, Campena Grandi and Peru cultivars exhibited considerable

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reduction in total length of radicle and hypocotyl specially under 500 ppm GA treatment.

4.Number of Lateral Roots (Fig.2, Tab.1): Lateral rooting was retarded in all the concentrations in Peru, Campena grandi, FG-3, FG-6, and K-8 and the value reduced with the increase in concentration. The highest value among all the cultivars was 6.90 in 50 ppm in comparison to 6.73 in control in Gum variety and the lowest value was 0.40 in 500 ppm in comparison to 1.47 in control in MU.

5.Fresh Weight (Fig.2, Tab.1): Fresh weight reduced at 500 ppm GA treatment in Peru, MU, FG-9 and K-8 varieties of *Leucaena leucocephala.* FG-9 exhibited reduction in fresh weight at 200 ppm also.

6.Dry Weight (Fig.2, Tab.1): All the concentrations were generally promotory or ineffective for Pirasicana, Gum variety, K-28, MU, FG-6 and FG-13. Reduction in dry weight was noticed under 500 ppm treatment only in Peru, FG-3 and K-8 and in 200ppm as well as 500 ppm both in Campena grandi and FG-9. The highest dry weight among all the cultivars was 0.042 gm. in 200 ppm in K-8.

DISCUSSION

Readings of the 7^{th} day have been considered for the discussion.

Saxena and Maheshwari (1979) in *Glycine max* reported that the different treatments of GA caused increase in hypocotyl length but decreased the radicle length. Prakash (1975) observed in *Catharanthus roseus* that GA in lower concentration increased the seedling length, while in higher concentration decreased it. Tayal and Gopal (1977) and Saraswathamma and Jayachandra (1981) also reported similar observations in *Trigonella- foenum- graecum*. Number of lateral roots reduced in all the concentrations of GA in five cultivars in the present investigation and reduction was observed above 50 ppm in two cultivars, above 100 ppm in three cultivars and above 200 ppm in one cultivar. Reduced number of lateral roots through GA treatment has also been reported by Prakash (1975) in *Catharanthus roseus* and Gupta and Murty (1986) in *Vicia faba*.

Both increase and decrease in dry weight due to GA treatment have been reported earlier. Increased fresh weight as well as dry weight has been observed by Rappaport (1957) in tomato. Kumar and Alka (1978) in *Raphanus sativus*, Datta and Pain (1982) in *Zea mays*, and Gupta and Murty (1986) in *Vicia faba*. Bukovac and wittwer (1956) have reported that there was no increase in dry weight of tomato seedlings. The increased fresh weight in treated seedlings can be accounted for higher amount of water absorption leading to an increase in seedling length and higher dry weight due to mobilization and traslocation of reserve food from the cotyledons into the hypocotyl and radicle. Babu and Kumar (1979) reported in leguminous plants that GA treatment was most effective in seed reserve utilization due to mobilization of reserve food material. In kinetin although CG, K-8, K-28 and FG-13 all underwent inhibition in all studied parameters related to seedling growth (Minu, 1990), GA exhibited such inhibition in mostly lateral rooting and dry matter in CG, K-8 (as in kinetin) and in Peru,FG-3, FG-9 and slightly in FG-13. Such differential behaviour needs to be analysed further in the light of molecular dynamics.

Decrease in fresh weight and dry weight under GA treatment may be due to triggering of autocontrolled exosmosis and loss of water, leading further to lowered amylase activity and reduced sugar content. Hyperphysiological concentrations of GA or any PGR may lead to a stress condition increasing (?) climacteric respiratory rates and starvation injury. Over expression of GA-20 oxidase activity may also be responsible for reduced sensitivity to bioactive GA (Sakamoto *et. al.* 2003).

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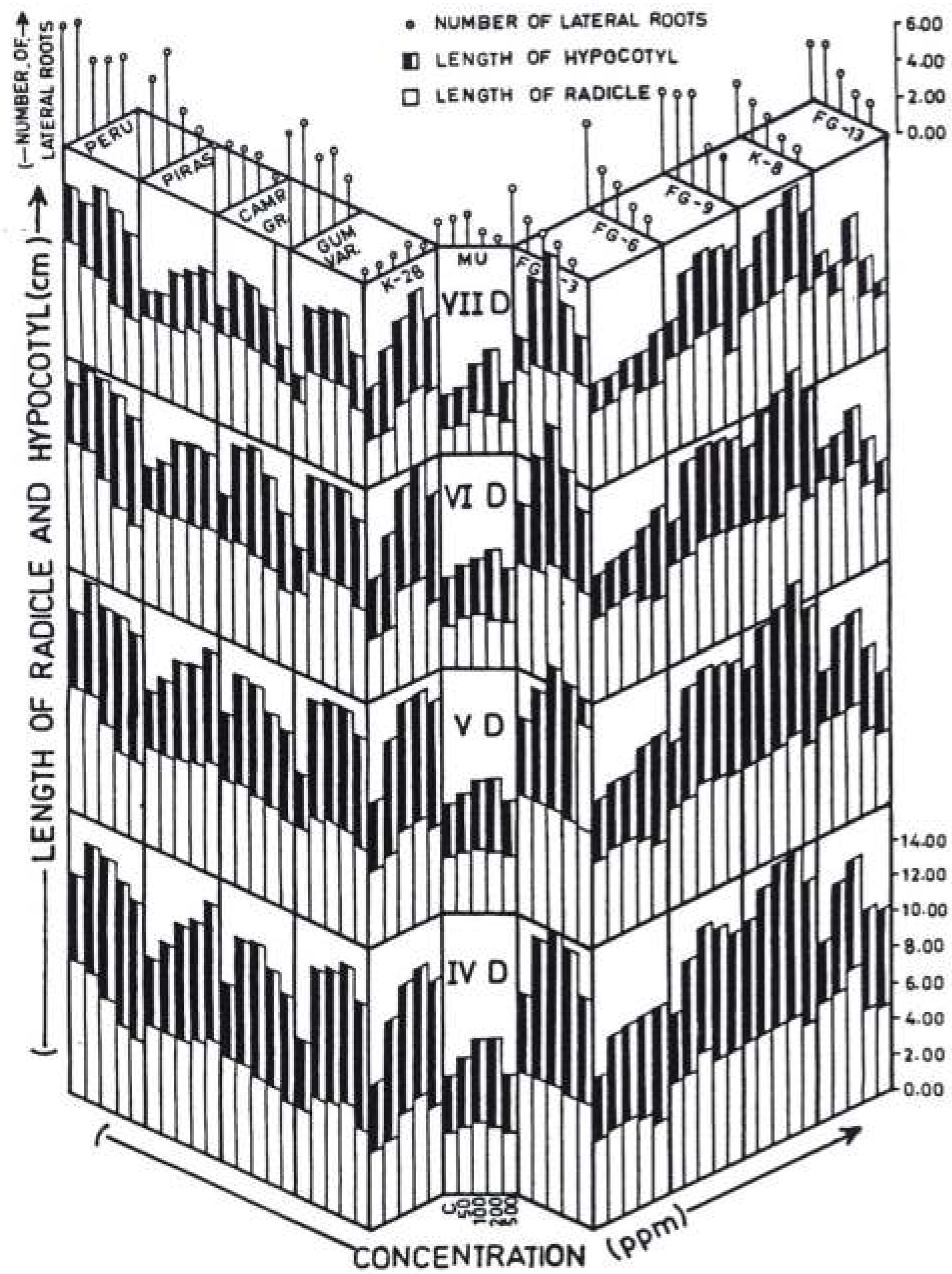

Figure 1: Effects of different concentrations of GA on length parameters and lateral rooting in eleven cultivars of *Leucaena leucocephala*

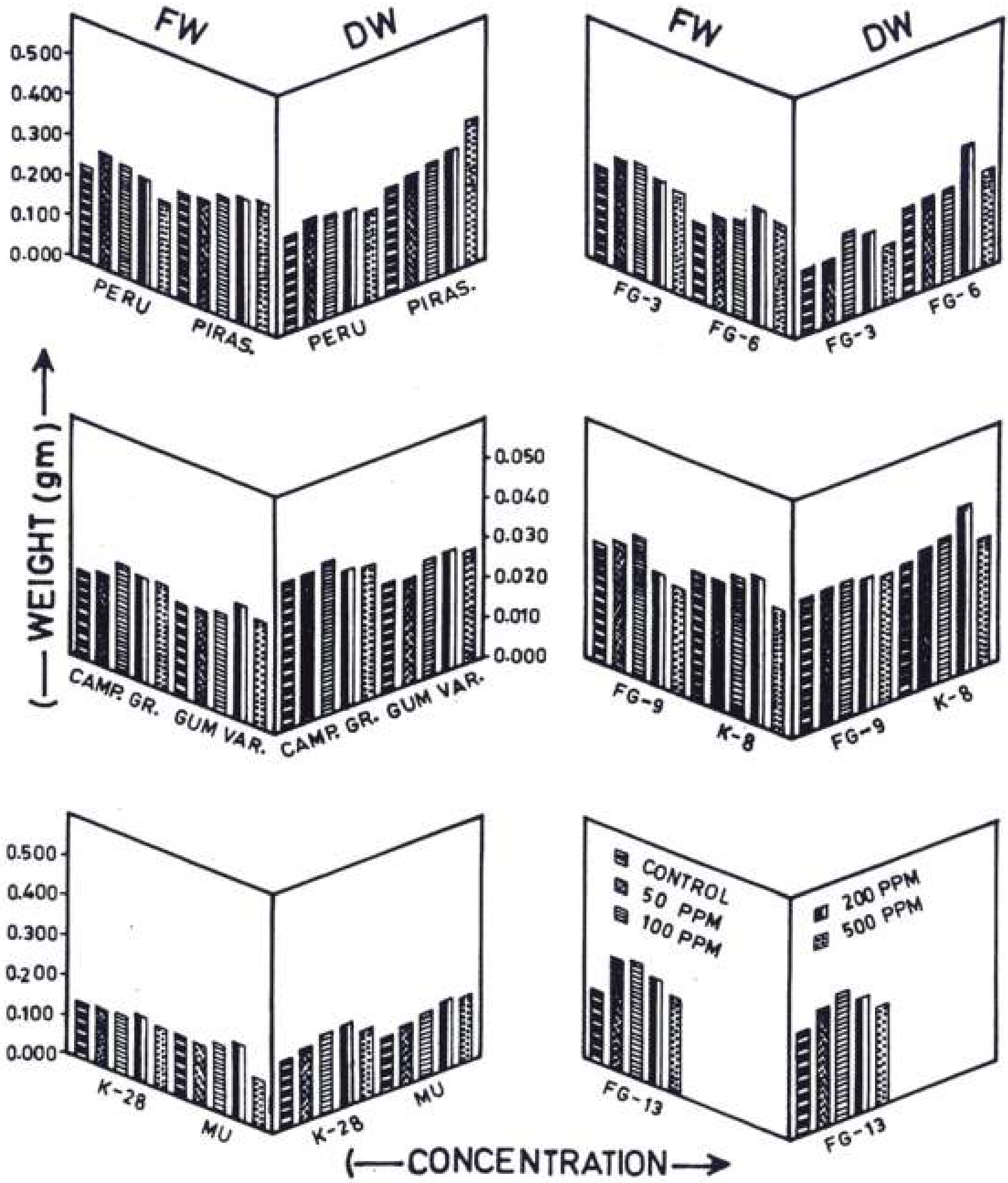

Figure 2: Effects of different concentrations of GA on weight parameters in eleven cultivars of *Leucaena leucocephala*

Table:-1 EFFECT OF DIFFERENT CONCENTRATIONS (PPM) OF GIBBERELLIC ACID (GA) ON SEEDLING GROWTH AND DEVELOPMENT (7^{TH} DAY AFTER SOAKING) IN DIFFERENT CULTIVARS OF LEUCAENA LEUCOCEPHALA (LAMK.) De wit.

CONC./CULTIVERS	50	100	200	500
PERU	R(-) H(+) S(*) L(-) F(*) D(*)	R(-) H(+) S(+) L(-) F(+) D(*)	R(-) H(*) S(+) L(-) F(+) D(+)	R(-) H(+) S(+) L(-) F(-) D(-)
PIRASICANA	R(+) H(+)S(+) L(+)F(+)D(+)	R(+)H(+)S(+)L(*)F(+)D(+)	R(+)H(+)S(+)L(-)F(+)D(+)	R(*) H(*) S(*) L(-)F(*) D(*)
CAMP. GR.	R(*) H(+) S(+) L(-) F(+) D(=)	R(-) H(*) S(*) L(-) F(*) D(*)	R(-) H(+) S(+) L(-) F(+) D(-)	R(-) H(+) S(+) L(-) F(+) D(-)
GUM. VAR.	R(+) H(+) S(+) L(*) F(+) D(-)	R(+) H(+) S(+) L(-) F(+) D(*)	R(*) H(*) S(*) L(-) F(*) D(*)	R(+) H(+) S(+) L(-) F(+) D(=)
K-28	R(+) H(+) S(+) L(+) F(+) D(+)	R(+) H(+) S(+) L(+) F(+) D(*)	R(*) H(*) S(*) L(*) F(*) D(*)	R(+) H(+) S(+) L(-) F(+) D(+)
MU	R(+) H(+) S(+) L(+) F(+) D(+)	R(*) H(+) S(+) L(*) F(+) D(+)	R(+) H(*) S(*) L(-) F(*) D(*)	R(+) H(+) S(+) L(-) F(-) D(+)
FG-3	R(+) H(+) S(+) L(-) F(+) D(=)	R(*) H(*) S(*) L(-) F(*) D(*)	R(-) H(+) S(+) L(-) F(+) D(+)	R(-) H(+) S(+) L(-) F(+) D(-)
FG-6	R(+) H(+) S(+) L(-) F(+) D(=)	R(*) H(+) S(+) L(-) F(+) D(=)	R(+) H(+) S(+) L(-) F(*) D(*)	R(-) H(*) S(*) L(-) F(-) D(+)
FG-9	R(+) H(+) S(+) L(+) F(+) D(=)	R(*) H(+) S(*) L(*) F(*) D(=)	R(+) H(*) S(+) L(-) F(-) D(-)	R(+) H(+) S(+) L(-) F(-) D(-)
K-8	R(+) H(+) S(+) L(-) F(=) D(+)	R(+) H(+) S(+) L(-) F(+) D(+)	R(*) H(*) S(*) L(-) F(*) D(*)	R(-) H(+) S(+) L(-) F(-) D(-)
FG-13	R(+) H(+) S(+) L(*) F(+) D(+)	R(*) H(*) S(*) L(-) F(*) D(*)	R(-) H(+) S(+) L(-) F(+) D(+)	R(-) H(+) S(+) L(-) F(-) D(=)

R: LENGTH OF RADICLE, H: LENGTH OF HYPOCOTYL, S: TOTAL LENGTH OF RADICLE AND HYPOCOTYL, L: NUMBER OF LATERAL ROOTS, F: FRESH WEIGHT, D: DRY WEIGHT, - : REDUCTION IN VALUE AS COMPARED TO CONTROL, = : VALUE EQUAL TO CONTROL, + : PROMOTION IN THE VALUE AS COMPARED TO CONTROL, * : HIGHEST PROMOTION IN ALL THE CONCENTRATIONS OF GA IN PARTICULAR CULTIVAR

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