



ALLELOPATHIC EFFECT OF STEM AND ROOT EXTRACTS OF MANGIFERA INDICA L ON RAPHANUS SATIVUS L VAR. JAPANI AND H¹¹

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ABSTRACT:

Allelopathy is a current area of research and plays important role in nature and agro ecosystem. It may be useful in agriculture to increase yield, minimize some problems related to multiple cropping systems, soil productivity and transformed the research from basic to applied. *Mangifera indica* L Family Anacardiaceae a common, large evergreen tree grow naturally everywhere on agricultural bunds. The fruit 'Amba' is a very delicious fruit and known as king of fruit. Effect of aqueous root extract were tested on the germination and seedling growth of *Raphanus sativus* L variety Japoni and H¹¹. Stem and root extract shows inhibitory effect at all concentration except at 2.5%. Data were analyzed by appropriate statistical method.

Key words: Allelopathy, Extract, *Mangifera indica* L., *Raphanus sativus*, 'Japoni' and H¹¹.

INTRODUCTION AND REVIEW:

Molisch (1937) introduced the word 'Allelopathy' (Greek words: 'allelon' means reciprocal and 'pathos' means that happens to one) for harmful as well as beneficial, biochemical and reciprocal interactions among plants including microorganisms. Allelopathy is defined as "any direct or indirect harmful/useful effect by one plant on another through the synthesis and secretion of chemicals into the environment."

Allelopathy is a current area of research. It may be useful in agriculture to increase yield, minimize some problems related to multiple cropping systems, soil productivity and availability of nutrients in soil. Allelopathy, a multidisciplinary subject and research in it will definitely establish a boon in agricultural and forestry production (Narwal and Tauro, 1994).

Leaf extracts of *Mangifera indica* L. contain an allelopathin called 'mangiferin' (1, 3, 6, 7-tetra hydroxy 2-c-b-glucopyranosylxanthone). It affects germination in *Triticum aestivum* L. and

Abelmoschus esculentus L. (Venkateshwarlu *et al* 2001). Aqueous extracts of *Mangifera indica* L. inhibit the germination and growth of maize, soybean, *Cucurbita moschata*, *Echinochloa* and *Digitaria*. Extracts of lower concentration proved stimulating. The rhizosphere soil of *Mangifera* stimulated germination and growth of maize but inhibited groundnut (Yan, 2006).

MATERIAL & METHODS:

Extracts were obtained by crushing plant materials. 10% aqueous extracts (stock solution) obtained from root and stem of trees viz. *Mangifera indica* L. Extracts were filtered with muslin cloth and Whatman filter paper No.1, stored in refrigerator and further diluted with distilled water to get extracts of 2.5 %, 5 %, and 7.5 % (Narwal, 1994). Extracts were further used for bioassay in laboratory conditions.

Effect of these three concentrations on seedling growth parameters viz. seed

germination (Ger), Shoot growth (Sg), Root growth (Rg) and Total seedling growth (TSg) of test crop plants viz. *Raphanus sativus* L. 'Japani' and 'Hybrid 11' were recorded after 5th day. Seeds of test plants were surface sterilized with 0.01% Mercuric chloride followed by washing with distilled water before use. Ten seeds/ plastic container were germinated in sterilized containers of 12cm diameter, using germination paper or Whatman No.1 filter paper. Triplicates of the containers were maintained. 10 ml of extract was added in the Petri dishes/containers containing 10 seeds each. The slight emergence of radical was considered as a sign of germination. Germination percentage was calculated. Photographs were taken with digital camera ('Sony'make). Percentage inhibition or stimulation of 'Ger' (seed Germination), 'Rg' (Root growth), 'Sg' (Shoot growth) and 'TSg' (Total seedling growth) over control was calculated from which graphs were drawn. Effect of leaves extract, were assessed separately. Statistical analysis were made. Percentage inhibition or stimulation over control and ANOVA variance was calculated. % Inhibition or stimulation: $(C-T / C) \times 100$ (Where C: control, T: treatment)

RESULT AND DISSCUSSION:

1. A. Effect of root extracts of *Mangifera indica* L. on 'Japani' variety:

Except slight promotion of 'Rg' by 5.79% over control at 2.50 % extract concentration, root extracts of *Mangifera* exerted inhibitory effect on seedling growth parameters of 'Japani' variety. Extracts significantly inhibited seedling growth parameters viz. 'Rg', 'Sg', 'TSg' and 'Ger' by 38.90 to 66.86%, 8.76 to 78.41%, and 7.44 to 73.78% and 29.63% respectively over control (Table NO.1, Graph NO. 1A).

1. B. Effect of root extracts of *Mangifera indica* L. on 'Hybrid 11' variety:

Root extract of 2.5 % concentration slightly promoted germination (Ger) and root growth (Rg) by 3.84% and 3.17% respectively over control. Root extracts of higher conc. significantly inhibited seedling growth parameters viz. 'Rg', 'Sg', 'TSg' and 'Ger' of the test plant by 53.97 to 72.49 %, 12.41 to 82.12%, 6.05 to 78.19% and 42.29 to 53.85% respectively over control (Table NO.1, Graph NO. 1B).

1. C. Effect of stem extracts of *Mangifera indica* L. on 'Japani' variety (Plate NO11):

Aqueous extracts of all concentrations of *Mangifera indica* L. promoted shoot growth (Sg) by 2.31 to 27.55 % over control. However, 'Rg' was inhibited by 2.71 to 31.41% over control. TSg was slightly promoted at lower concentration by 7.51%. Extracts of 5.00 to 7.50% conc. inhibited 'TSg' and 'Ger' by 2.19 to 20.02% and 3.45 to 6.89% over control respectively (Table NO1 and Graph NO 1C).

1. D. Effect of stem extracts of *Mangifera indica* L. on 'Hybrid 11' variety:

Extract of lower conc. (2.50%) promoted root growth (Rg), shoot growth (Sg) and Total seedling growth (TSg) by 12.87 %, 2.40% and 8.47% over control respectively (Table No.1, Graph No. 1D). Extracts of higher concentrations (5% to 7.5%), however proved inhibitory. Seedling growth parameters viz. 'Rg', 'Sg', 'TSg' and 'Ger' were inhibited by 2.76 to 15.40%, 10.21 %, 1.17 to 13.04% and 18.52 % respectively over control. Extracts of 5.00% exerted more inhibition. Inhibition was not significant ($P < 0.05\%$) (Table NO.1, Graph NO. 1D).

SUMMARY AND CONCLUSION:

Root extracts of *Mangifera indica* L. inhibited maximally all seedling growth parameters of 'Hybrid 11' and 'Japani' varieties of *Raphanus sativus* L. Stem and root extracts of lower conc. were promotory. Inhibition followed an order: Root >stem. Extracts of different plant parts exerted differential effects on seedling growth of the two varieties.

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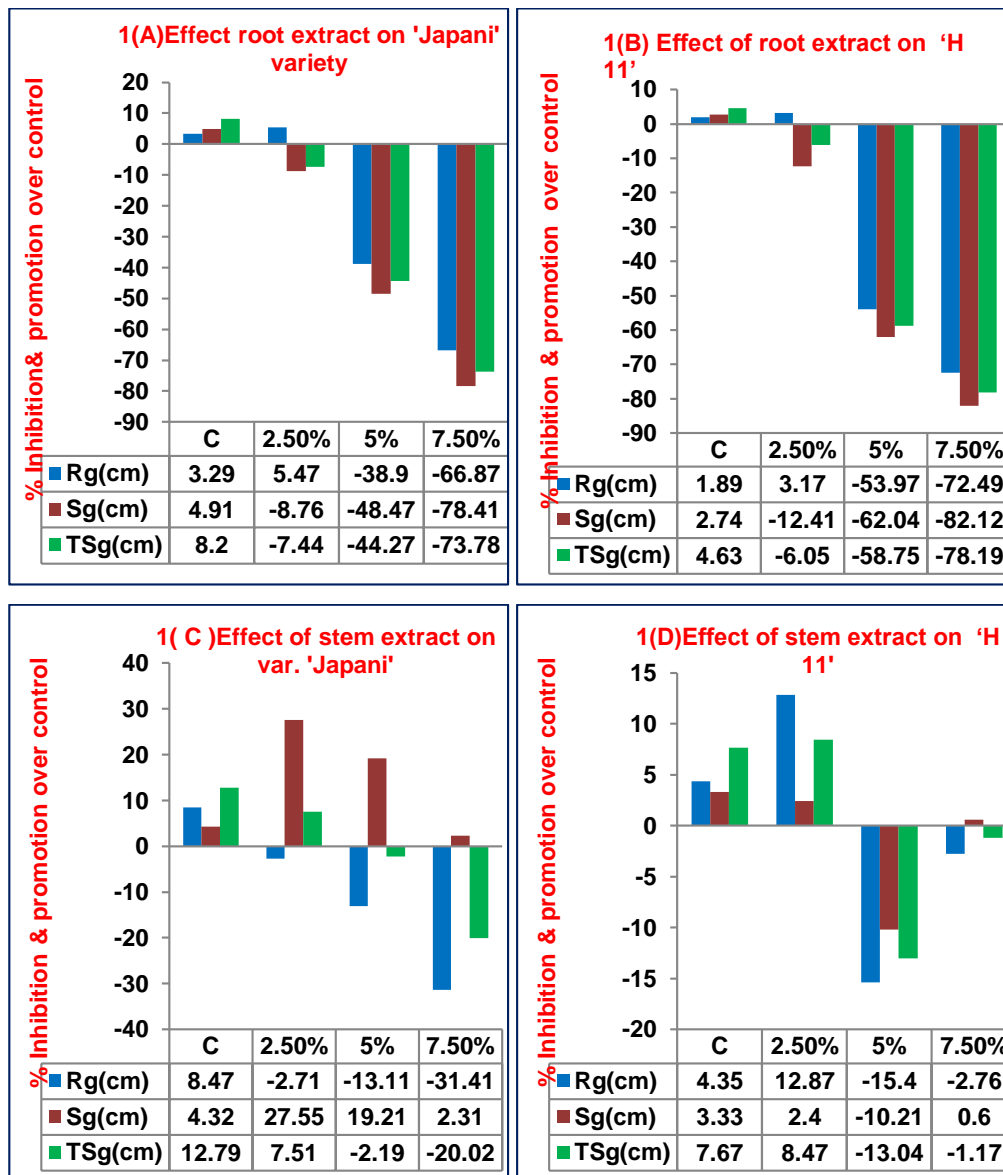
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Graph No:1 Effect of root & Stem extracts of *Mangifera Indica* L. on seedling growth of varieties of *Raphanus sativus* and H¹¹Linn.



[Where Rg: root growth, Sg: shoot growth, TSg: total seedling growth, H11:Hybrid 11 figures indicate % inhibition (-) and % promotion (+) over control, C: control, 2.50 to 7.50% : Extract concentration].

Table NO 1 : Effect of aqueous stem and root extracts of *Mangifera Indica* L. on germination and seedling growth of varieties of *Raphanus sativus* Linn. Japoni and Hybrid 11

Extract	<i>Raphanus</i> Varieties	Growth Parameters	Control	Extract concentration			CD at 0.05%	P-Value at 0.05%
				2.50%	5%	7.50%		
Root	Japoni	Rg(cm)	3.29a ± 0.38	3.47a ± 0.49 (5.47)	2.01b ± 0.27 (-38.90)	1.09c ± 0.25 (-66.86)	0.68	9.31E-06
		Sg(cm)	4.91a ± 0.55	4.48a ± 0.59 (-8.76)	2.56b ± 0.42 (-47.86)	1.06c ± 0.31 (-78.41)	0.9	9.13E-08
		TSg(cm)	8.20a ± 23.68	7.95a ± 30.23 (-7.44)	4.57b ± 11.02 (-44.27)	2.15c ± 8.42 (-73.78)	1.46	1.01E-07
		Ger %	90	93.33 (3.70)	93.33 (3.70)	63.33 (-29.63)		
	Hybrid 11	Rg(cm)	1.89a ± 0.27	1.95a ± 0.28 (3.17)	0.87b ± 0.25 (-53.97)	0.52b ± 0.15 (-72.49)	0.46	3.01E-05
		Sg(cm)	2.74a ± 0.44	2.40a ± 0.37 (-12.41)	1.04a ± 0.26 (-62.04)	0.49ab ± 0.17 (-82.12)	1.5	2.53E-06
		TSg(cm)	4.63a ± 0.69	4.35a ± 0.60 (-6.05)	1.91cb ± 0.47 (-58.75)	1.01b ± 0.31 (-78.19)	1.01	1.98E-06
		Ger %	86.67	90.00 (3.84)	50.00 (-42.29)	40.00 (-53.85)		
Stm	Japoni	Rg(cm)	8.47a ± 1.08	8.24a ± 0.79 (-2.71)	7.36a ± 0.58 (-13.11)	5.81b ± 0.67 (-31.41)	1.5	0.09
		Sg(cm)	4.32a ± 0.44	5.51ab ± 0.45 (27.55)	5.15a ± 0.40 (19.21)	4.42a ± 0.52 (02.31)	0.85	0.19
		TSg(cm)	12.79 ± 1.44	13.75a ± 1.13 (7.51)	12.51a ± 0.91 (-2.19)	10.23b ± 1.12 (-20.02)	2.18	0.18
		Ger%	96.66	96.66 (0.00)	93.33 (-3.45)	90.00 (-6.89)		
	Hybrid 11	Rg(cm)	4.35a ± 0.64	4.91a ± 0.68 (12.87)	3.68ab ± 0.57 (-15.40)	4.23a ± 0.55 (-2.76)	1.15	0.57
		Sg(cm)	3.33a ± 0.42	3.41a ± 0.45 (2.40)	2.99a ± 0.44 (-10.21)	3.35a ± 0.41 (0.60)	0.81	0.90
		TSg(cm)	7.67a ± 1.04	8.32a ± 1.10 (8.47)	6.67a ± 0.10 (-13.04)	7.58a ± 0.90 (-1.17)	1.9	0.71
		Ger %	90	80.00 (-11.11)	73.33 (-18.52)	90.00 (0.00)		

[Data presented are means of three replicates; values within the same row with different letters are significantly different at 0.05% P-level by Single factor ANOVA test followed by CD & Tukey's test. [Figures in parentheses indicate % stimulation (+) and % inhibition (-) over control; Sg: shoot growth, Rg :root growth, TSg: total seedling growth and Ger: seed : germination].