

IMPROVED GROWTH AND PRODUCTIVITY OF RICE DUE TO FOLIAR SPRAY OF GROWTH PROMOTING SUBSTANCES FROM *LANTANA CAMARA*

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Defatted leaf extract of *Lantana camara*, when sprayed on some high yielding long duration rice cultivars during *Kharif* and HY local varieties during the *Rabi* season resulted in statistically significant increase in growth of the treated plants. The date of panicle initiation was considerably advanced and there was significant increase in yield/ plot in majority of the rice cultivars, in both the seasons.

Keywords : Growth promoting substances; *Lantana camara*, Rice.

Introduction

Application of commercially produced growth promoting substances for increased growth and yield of economically important crops has revolutionized agriculture in industrially advanced countries. In developing countries their large scale use is limited. Enhanced plant growth, early flowering up to 5 days, seed yield and 1000 grain wt., after exogenous application of commercial gibberelin has been reported in several crops¹⁻⁴.

Significant stimulatory effect of the leaf extracts of *Lantana camara* on rhizogenesis in rice callus and regenerated rice plantlets and also on growth and yield of high yielding *indica* rice have earlier been reported⁵⁻⁷. In the present communication the results of the study on the effect of *Lantana camara* on six high yielding long duration rice cultivars during the *Kharif* (wet) and some high yielding local cultivars grown in the *Rabi* (winter) seasons are presented.

Materials and Methods

Extract Preparation : Known amount of air dried young leaves of *Lantana camara* with pink yellow flowers was defatted in a Soxhlet apparatus for 36 hours. The defatted plant material was extracted with 95% ethyl alcohol in the cold, charcoalised and filtered. The charcoal was eluted several times with acetone: water [2 : 1] and the combined eluates evaporated to dryness under reduced pressure. The residue was dissolved in 2 to 3 drops of absolute alcohol and the volume made up to 10 ml with distilled water. This stock solution was further diluted to obtain

a concentration of 100 ppm which was used as foliar spray.

Field Experiment : This was conducted in the experimental plots of Department of Botany consecutively for two years (2001 and 2002). During the *Kharif*, six high yielding long duration cultivars viz. *Radhi*, *Savitri*, *Tapaswini*, CR-1014, *Lunishree* and *Gayatri* were used whereas during the *Rabi* season the experiment was carried out with HY local cultivars IET-4786, PNR-381 and IET-4094. One month old seedlings raised in the nursery, were transplanted in the plots measuring 1.5 m² and planted at a spacing of 15 x 15 cm between and along the rows. NPK was applied in the ratio of 3 : 1 : 1 in two equal split dosages @ 90 Kg of N/ha, and 30 Kg of P & K each/ha. The first application was done 15 days after transplantation and second at the maximum tillering stage. The plants were sprayed with the extracts at the maximum tillering stage @ 500 ml/ plot.

Plots without spraying were maintained as control. Spraying was done so as to get random block design. Twenty plants/ plot were selected randomly for observation on plant height, number of tillers, date of panicle initiation, number of panicles/tiller and the length of inflorescence. Yield/ plot & 1000 grain fresh wt. were calculated. The data of the each season for two years and 3 replications were pooled, the values transformed and analysed statistically.

Results and Discussion

The results obtained were very significant

Table 1 : Effect of *L. camara* leaf extract on plant growth and yield components of rice (*Kharij*).

Rice Cultivars	Plant height (ft)	No. of tillers hill ⁻¹	Panicle initiation (days)	No of panicles tiller ⁻¹	Length of inflorescence (cm)	1000 grain wt. (fresh) (g)	Yield Plot ¹ (kg)
Radhi							
U	4.55 (2.13)	12.25 (3.5)	100	7.0 (2.65)	18.75 (4.33)	0.76 (0.88)	0.033 (0.182)
S	7.28 (2.70)	12.75 (3.57)	73	17.0 (4.12)	20.5 (4.53)	3.03 (1.74)	1.007 (1.003)
S. E. ±	0.17	—	0.06	0.17	—	0.20	0.20
C. D. at 5%	0.54	NS	0.33	0.40	NS	0.47	0.48
Tapaswini							
U	6.32 (2.51)	11.25 (3.35)	124	4.25 (2.06)	22.5 (4.74)	0.85 (0.92)	0.233 (0.483)
S	8.70 (2.95)	27.75 (5.28)	100	14.0 (3.74)	23.0 (4.80)	0.975 (0.99)	0.328 (0.573)
S. E. ±	0.10	0.14	0.05	0.12	—	—	—
C. D. at 5%	0.24	0.33	0.29	0.28	NS	NS	NS
Savitri					18.5 (4.30)	0.08 (0.28)	0.187 (0.432)
U	6.74 (2.60)	11.75 (3.43)	150	3.50 (1.87)	20.8 (4.56)	2.75 (1.66)	0.743 (0.862)
S	10.82 (3.29)	13.75 (3.70)	120	12.5 (3.54)	—	0.27	0.04
S. E. ±	0.11	—	0.06	0.04	NS	0.63	0.09
C. D. at 5%	0.26	NS	0.36	0.09			
CR 1014							
U	8.32 (2.88)	15.0 (3.87)	140	7.0 (2.65)	22.75 (4.77)	18.6 (4.31)	0.204 (0.452)
S	13.73 (3.71)	40.75 (6.38)	108	8.0 (2.83)	25.0 (5)	20.5 (4.53)	0.403 (0.635)
S. E. ±	0.05	0.21	0.06	—	—	—	—
C. D. at 5%	0.18	0.50	0.38	NS	NS	NS	NS
Lunishree							
U	6.0 (2.45)	6.0 (2.45)	135	4.75 (2.18)	16.75 (4.09)	0.03 (0.17)	0.333 (0.577)
S	12.9 (3.59)	22.5 (4.74)	125	5.5 (2.35)	18.50 (4.30)	3.55 (1.88)	0.993 (0.996)
S. E. ±	0.05	0.30	0.02	—	—	0.23	0.03
C. D. at 5%	0.18	0.71	0.12	NS	NS	0.55	0.07
Gayatri							
U	8.53 (2.92)	14.0 (3.74)	140	6.25 (2.5)	18.25 (4.27)	0.16 (0.4)	0.244 (0.494)
S	72.93 (8.54)	31.5 (5.61)	130	12.25 (3.5)	20.0 (4.47)	3.15 (1.77)	0.483 (0.695)
S. E. ±	0.14	—	0.02	0.21	—	0.37	0.04
C. D. at 5%	0.33	NS	0.12	0.50	NS	0.88	0.10

U - Unsprayed, S - Sprayed

Figures in parenthesis represents square root transformed values

Table 2 : Effect of *L. camara* leaf extract on plant growth and yield components of rice (*Rabi*).

Rice Cultivars	Plant height (ft)	No. of tillers hill ⁻¹	Panicle initiation (days)	No of panicles tiller ⁻¹	Length of inflorescence (cm)	1000 grain wt (fresh) (g)	Yield Plot ⁻¹ (kg)
IET-4786							
U	31.0 (5.57)	6.00 (2.45)	96	5.25 (2.29)	24.5 (4.95)	15.63 (3.95)	0.324 (0.569)
S	43.5 (6.60)	22.5 (4.74)	96	18.0 (4.24)	21.0 (4.58)	18.55 (4.31)	1.34 (1.16)
S. E. ±	0.16	0.30	-	0.23	-	-	0.05
C. D. at 5%	0.37	0.71	NS	0.55	NS	NS	0.13
IET-4094							
U	24.5 (4.95)	10.25 (3.20)	119	4.25 (2.06)	21.3 (4.62)	19.1 (4.37)	0.186 (0.431)
S	44.5 (6.67)	22.75 (4.77)	106	13.5 (3.67)	23.5 (4.85)	21.2 (4.60)	9.749 (0.865)
S. E. ±	0.21	0.27	0.06	0.12	-	-	0.04
C. D. at 5%	0.49	0.64	0.12	0.28 ^{ab}	NS	NS	0.09
PNR-381							
U	31.6 (5.62)	11.25 (3.35)	119	6.25 (2.5)	21.0 (4.58)	20.0 (4.47)	0.492 (0.701)
S	52.0 (7.21)	27.75 (5.27)	106	13.0 (3.61)	24.0 (4.90)	18.75 (4.33)	0.879 (0.938)
S. E. ±	-	0.14	0.06	0.27	-	-	-
C. D. at 5%	NS	0.33	0.12	0.63	NS	NS	NS

& encouraging. Rice cultivars showed vast improvement in growth and yield in both the growth seasons. In the *Kharif*, all the six HY long duration varieties showed statistically significant difference in height between the sprayed & unsprayed plants (Table 1). The increase in the number of tillers was significant only in cv. *Tapaswini*, CR-1014, *Lunishree* whereas in *Radhi*, *Savitri*, and *Gayatri* though an increase in the no. of tillers were observed it was not found to be statistically significant. Time taken for panicle initiation in days was considerably reduced in all treated six varieties and the difference statistically significant (Table 1). In the cultivar CR-1014, *Savitri*, *Radhi*, and *Tapaswini* panicle initiation was advanced by 32 to 24 days, whereas in *Lunishree* and *Gayatri*, it was advanced by 10 days compared to the control. Increase in the length of inflorescence was however not significant. When the yield components viz. 1000 grain wt. (fresh wt.) and yield per plot of the treated untreated plants were recorded it was found that in *Radhi*, *Savitri*, *Lunishree*

and *Gayatri*, the yield per plot increased significantly and there was a corresponding statistically significant increase in the 1000 grain fresh wt. between the treated and untreated plants. In *Tapaswini* and CR-1014, though an increase in the yield per plot & 1000 grain wt. was observed, the difference was not significant.

In the *Rabi* season (Table 2), statistically significant difference in plant height and number of tillers/ hill was observed in the sprayed plants of the HY local cv. IET-4786 and IET-4094. Though the sprayed cv. PNR-381 plants appeared taller than the unsprayed ones, the difference was statistically non significant. The difference in the number of tillers/ hill was found to be significant between the sprayed and unsprayed plants.

Panicle initiation in days was reduced in cv IET-4094 and PNR-381 by 13 days while no change was observed in IET-47786 (Table 2). However in all these 3 varieties the number of panicles per tiller increased compared with the unsprayed

plants and difference in all the three cases was found to be statistically significant. No statistical significance was found to exist in the difference in the length of inflorescence & 1000 grain fresh wt. between sprayed and unsprayed plants of any of the three varieties grown in the winter season even though a slight increase between them was observed. Statistically significant increase in yield per plot was recorded in sprayed plants of IET-4786 and IET-4094. In PNR-381 the increase in yield was not significant.

Application of growth promoting substances like gibberellin has variable effect on flowering in plants. In castor bean flowering was delayed⁸ whereas in siratro the flowering date was advanced and there was an increase in yield due to such application⁴. In the present investigation significant increase in yield and advancement in panicle initiation has been observed in all the varieties of *Kharif* and in two varieties in *Rabi* season. The results obtained assume special significance because of the fact that only the leaf extract of *L. camara* was used, instead of any commercially produced synthetic growth

promoting compound. Advancement of date of panicle initiation and increase in yield components indicates the presence of some growth promoting substances in the leaves of *L. camara*. Further work needs to be done to characterize the compound(s). Application of such plant products could be both economical and profitable to the cultivators since the plant is easily available and poses no threat to the environment.

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