

## Effect of green manuring of Garadi leaves (*Cleistanthus collinus*) on soil physico-chemical properties and yield of paddy in Eastern Vidharbha Zone

R.F. RAUT, N.V. KAYANDE AND P.P. DEBAJE

### ABSTRACT

A study on effect of garadi leaves (*Cleistanthus collinus*) on physico-chemical properties of soil and yield of paddy was carried out on clay loam soil with available N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O 220.0, 28.0, 290.0 kg ha<sup>-1</sup>, respectively during *Kharif* for consecutive three years from 2007-2009 at Agriculture Research Station, Sindewahi (Chandrapur) in the Eastern Vidharbha Zone. The experiment comprised of seven treatments (i.e. control garadi leaves application @ 0.75 t ha<sup>-1</sup>, garadi leaves application @ 1.0 t ha<sup>-1</sup>, garadi leaves application @ 1.25 t ha<sup>-1</sup>, garadi leaves application @ 1.50 t ha<sup>-1</sup>, spraying of monocrotophos as per recommendation and foliar spray of 10 per cent garadi leaves extract) replicated thrice in randomized block design. The recommended dose of fertilizer 100:50:50 kg NPK ha was applied to all the treatments. The pooled result revealed that the application of garadi leaves @ 1.5 ha<sup>-1</sup> gave significantly higher paddy grain yield over rest of the treatments except treatment garadi leaves application @ 1.25t ha<sup>-1</sup> which was at par with treatment garadi leaves application @ 1.50 t ha<sup>-1</sup>. The treatment T<sub>5</sub> gave 6.70 per cent 12.85 per cent and 30.52 per cent more grain yield over T<sub>4</sub>, T<sub>6</sub> and control, respectively. The bulk density was found to be decreased by incorporation of garadi leaves indicating the improvement of soil structure porosity, and maximum water holding capacity. The available NPK kg ha<sup>-1</sup> was also increased due to application of garadi leaves. Hence, it can be stated that the application of garadi leaves @ 1.5t ha<sup>-1</sup> gave higher monetary return.

**KEY WORDS** : Garadi leaves, Green manuring, Physico-chemical properties

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### INTRODUCTION

Organic manures application generally improve the soil physical chemical and biological properties along with conserving and improving the moisture holding capacity of soil and results in enhanced crop productivity.

Green manuring is also a cheap and effective way of improving soil fertility as long as water conditions permit. It proves better and efficient as fertilizer for rice crop. Green manuring in combination with chemical fertilizers improves the soil fertility, yield and also has residual effect on succeeding crop. In paddy, it has been observed that green manuring before transplanting helps to sustain with high yield levels. Agro forestry is an age old land use that has been practiced by farmers and agrisilviculture is the major class of agro forestry. Garadi (*Cleistanthus collinus*) is one of the most important multipurpose tree

which grow very profusely in wasteland forests and paddy bunds in Eastern Vidharbha Zone of Maharashtra state used as green manure (2.18%N) and for fencing as it contains *Cleistanthus* which is toxic and repellent for insects and pests of paddy crop. Research work is not available on this tree in EVZ. Keeping this in view, the present study was undertaken to study the effect of garadi leaves on growth yield of paddy and physico-chemical properties of soil.

### MATERIALS AND METHODS

Experiment was conducted for consecutive three years during *Kharif* 2007-2008 to 2009-2010 at Zonal Agriculture Research Station, Sindewahi, District, Chandrapur. The experiment was laid out in randomized block design with three replications. There were seven treatments *viz.*, control, incorporation of garadi leaves @ 0.75 t ha<sup>-1</sup> at transplanting, Garadi leaves incorporation @ 1.0 t ha<sup>-1</sup>, incorporation of garadi leaves @ 1.25t ha<sup>-1</sup>, incorporation of garadi leaves @ 1.50 t ha<sup>-1</sup>, spraying of monocrotophos as per recommendation (0.05%) and foliar spray of 10 per cent garadi leaves extract. A common dose of 100:50:50 kg NPK ha<sup>-1</sup> was applied to all treatments. Rice variety PKV HMT was used. The gross

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and net size was 4.0 x 4.5 m<sup>2</sup> and 3.6 x 4.20m, respectively. The crop was transplanted at 20x15 cm spacing during the second week of July during all three years. The initial fertility status was pH 7.1, EC (dSm<sup>-1</sup>)0.19. The soil was low in organic carbon, nitrogen and phosphorus and rich in potash (organic carbon 0.35 per cent total N739, available N<sub>2</sub>20 kg ha<sup>-1</sup> available, P<sub>2</sub>O<sub>5</sub> 28 kg ha<sup>-1</sup> and available K<sub>2</sub>O 290kg ha<sup>-1</sup>). The irrigation was given as per requirement.

## RESULTS AND DISCUSSION

The results obtained from the present investigation as well as well as relevant discussion have been presented under following heads :

### Grain yield of paddy:

The data on grain yield of paddy presented in Table

1 indicated that incorporation of garadi leaves @ 1.5t ha<sup>-1</sup> recorded significantly higher grain yield as compared to rest of the treatments during 2007-2008 and 2008-2009.

In the pooled result of three years the incorporation of garadi leaves @ 1.5t ha (T<sub>5</sub>) gave significantly higher grain yield over all other treatments; however it was at par with treatment T<sub>4</sub>. Incorporation of garadi leaves @ 1.5t ha (T<sub>5</sub>) gave 6.70 per cent 12.85 per cent and 30.52 per cent more grain yield over T<sub>4</sub>, T<sub>6</sub> and control, respectively. This is attributed due to higher N content in garadi leaves that becomes available to crop.

### Physical and chemical properties of soil:

The data obtained after the analysis of post harvest soil (Table 2 and 3) indicated that bulk density found to be decreased by incorporation of garadi leaves indicating the improvement of soil structure. The porosity and maximum water holding capacity was increased due to incorporation

**Table 1 : Mean grain yield as influenced by various treatments**

Treatments	Grain yield (q ha <sup>-1</sup> )			
	2007-08	2008-09	2009-10	Pooled mean (q ha <sup>-1</sup> )
T <sub>1</sub> -control	20.14	16.51	51.92	29.52
T <sub>2</sub> -Garadi leaves application @ 0.75 t ha <sup>-1</sup>	25.02	20.27	56.92	30.07
T <sub>3</sub> - Garadi leaves application @1.00 t ha <sup>-1</sup>	26.77	20.39	57.93	35.03
T <sub>4</sub> - Garadi leaves application @1.25 t ha <sup>-1</sup>	28.52	21.65	58.18	36.11
T <sub>5</sub> - Garadi leaves application @1.50 t ha <sup>-1</sup>	33.52	22.77	59.30	38.53
T <sub>6</sub> - Spraying of monocrotophos (0.05%)	24.77	21.52	57.53	34.60
T <sub>7</sub> - Foliar spray of (10%) garadi leaves extract	24.02	20.27	58.15	34.14
'F' test	Sig.	Sig.	NS	Sig.
S.E. (m)±	0.84	1.11	1.75	0.91
C.D. (P=0.05)	2.59	3.13	-	2.56
CV%	4.54	9.44	5.33	-

NS=Non-significance

**Table 2 : Physical properties of soil as influenced by different treatments**

Treatments	2007-08				2008-09				2009-10			
	B.D. g/cm <sup>3</sup>	P.D. g/cm <sup>3</sup>	Porosity %	MWHC %	B.D. g/cm <sup>3</sup>	P.D. g/cm <sup>3</sup>	Porosity %	MWH C %	B.D. g/cm <sup>3</sup>	P.D. g/cm <sup>3</sup>	Porosit y %	MWHC %
T <sub>1</sub> - Control	1.42	2.26	33.05	35.90	1.41	2.25	33.05	35.90	1.43	2.27	33.05	35.92
T <sub>2</sub> -Garadi leaves application @ 0.75 t ha <sup>-1</sup>	1.39	2.18	33.20	36.09	1.38	2.19	33.20	36.09	1.40	2.18	33.20	36.10
T <sub>3</sub> -Garadi leaves application @1.00 t ha <sup>-1</sup>	1.37	2.21	30.20	38.68	1.38	2.20	33.70	38.61	1.38	2.21	39.70	38.70
T <sub>4</sub> - Garadi leaves application @1.25 t ha <sup>-1</sup>	1.35	2.20	34.10	41.19	1.36	2.20	34.11	41.19	1.36	2.20	34.10	41.20
T <sub>5</sub> - Garadi leaves application @1.50 t ha <sup>-1</sup>	1.37	2.09	34.95	41.49	1.38	2.09	34.90	41.48	1.38	2.10	34.95	41.52
T <sub>6</sub> - Spraying of Monocrotophos (0.05%)	1.42	2.25	33.05	34.90	1.39	2.25	33.04	24.90	1.43	2.26	33.05	34.95
T <sub>7</sub> - Foliar spray of (10%) garadi leaves extract	1.42	2.26	33.07	35.18	1.40	2.26	33.07	35.18	1.44	2.26	33.07	35.20

**Table 3 : Chemical properties of soil as influenced by different treatments**

Treatments	2007-08				2008-09				2009-10			
	O.C. %	N kg ha <sup>-1</sup>	P <sub>2</sub> O <sub>5</sub> kg ha <sup>-1</sup>	K <sub>2</sub> O kg ha <sup>-1</sup>	O.C. %	N kg ha <sup>-1</sup>	P <sub>2</sub> O <sub>5</sub> kg ha <sup>-1</sup>	K <sub>2</sub> O kg ha <sup>-1</sup>	O.C. %	N kg ha <sup>-1</sup>	P <sub>2</sub> O <sub>5</sub> kg ha <sup>-1</sup>	K <sub>2</sub> O kg ha <sup>-1</sup>
T <sub>1</sub> - Control	0.35	220	29	284	0.34	222	28	280	0.36	222	30	285
T <sub>2</sub> -Garadi leaves application @ 0.75 t ha <sup>-1</sup>	0.40	226	31	300	0.40	224	30	291	0.42	227	32	310
T <sub>3</sub> -Garadi leaves application @1.00 t ha <sup>-1</sup>	0.44	228	35	330	0.41	226	34	330	0.46	230	36	340
T <sub>4</sub> - Garadi leaves application @1.25 t ha <sup>-1</sup>	0.50	235	37	341	0.49	237	36	340	0.50	236	37	345
T <sub>5</sub> - Garadi leaves application @1.50 t ha <sup>-1</sup>	0.50	246	41	342	0.50	246	40	342	0.55	247	42	350
T <sub>6</sub> - Spraying of monocrotophos (0.05%)	0.50	220	30	230	0.50	221	30	241	0.39	223	31	230
T <sub>7</sub> - Foliar spray of (10%) garadi leaves extract	0.49	220	30	284	0.48	221	30	231	0.34	224	31	285

**Table 4 : Economic analysis**

Treatments	Mean of cost cultivation (Rs.)	Pooled mean of grain yield (q ha <sup>-1</sup> )	Mean straw yield (q ha <sup>-1</sup> )	Gross monetary return (Rs. ha)	Net monetary return (Rs. ha <sup>-1</sup> )	C:B ratio
T <sub>1</sub> - Control	15750	29.52	33.08	36581	20831	1:2.32
T <sub>2</sub> -Garadi leaves application @ 0.75 t ha <sup>-1</sup>	15925	30.07	35.99	37343	21418	1:2.34
T <sub>3</sub> -Garadi leaves application @1.00 t ha <sup>-1</sup>	16010	35.03	36.08	43299	27289	1:2.70
T <sub>4</sub> - Garadi leaves application @1.25 t ha <sup>-1</sup>	16075	36.11	37.48	44643	28568	1 :2.77
T <sub>5</sub> - Garadi leaves application @ 1.50 t ha <sup>-1</sup>	16140	38.53	39.41	47615	31475	1 :2.95
T <sub>6</sub> - Spraying of monocrotophos (0.05%)	16862	34.60	36.59	42800	25938	1:2.53
T <sub>7</sub> - Foliar spray of (10%) garadi leaves extract	15118	34.14	37.15	42268	27150	1:2.79
Selling rate of PKV HMT : Rs.1200q <sup>-1</sup>				Garadi leaves: Rs.250 t ha		
Cost of Monocrotophos : Rs..350l <sup>-1</sup>				Straw : Rs.35 q <sup>-1</sup>		

of 1.5t ha<sup>-1</sup> garadi leaves. Available NPK was also increased due to incorporation of garadi leaves. Similar results were reported by Chaphale *et al.* (2000) with glyricidia green manuring and Gangwar *et al.* (2004) with subabul (*Leucaena leucocephala*) green manuring.

#### Economic analysis:

The data on cost of cultivation, gross and net monetary return and cost benefit ratio as influenced by various treatments ( Table 4 ) indicated that the highest cost benefit ratio was recorded with application of garadi leaves @ 1.5 t ha<sup>-1</sup> followed by foliar sprays of 10 per cent garadi leaves extract and garadi leaves application @ 1.25 and 1.0 t ha<sup>-1</sup>.

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