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Effect of placement of fertilizers and organic manure under drip irrigation on soil health and economics of brinjal (*Solanum melongena* L.)

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ABSTRACT

A field experiment was conducted during *Rabi* season of 2005 - 2006 at the Department of Agronomy Farm, College of Agriculture, Dapoli to study the effect of different treatments on soil health and economics of *Rabi* brinjal. The results indicated that the available P_2O_5 (Kg ha^{-1}) and organic carbon in soil were significantly higher under treatment RD through soluble fertilizer and urea (fertigation). Available nitrogen, phosphorus (Kg ha^{-1}) and Organic carbon in soil were significantly higher in the treatment band placement of poultry manure along the rows. The highest gross and net income and B:C ratio were recorded by the treatment combination RDCF, below dripper and poultry manure placement below hill.

Key words : Brinjal, Nitrogen, P_2O_5, RD, fertigation, gross income, Net income, B:C ratio,Dripper and poultry manure

INTRODUCTION

Brinjal or egg plant (*Solanum melongena* L.) belongs to family Solanaceae, is one of the most common, popular vegetable crop grown in India and other parts of the world. It has high nutritive value which can be compared with tomato. It contains 92.7 per cent moisture, 4.0 per cent carbohydrates, 1.4 per cent proteins, 0.3 per cent fats, 0.3 per cent minerals and 1.3 per cent fibre (Aykroyd, 1963). Adoption of modern irrigation technology like drip irrigation which save water upto 40-70 per cent as well as increasing the crop production to the extent of 20 to 100 per cent (Reddy and Reddy 2003). Placement of manure and fertilizers is of prime importance in drip irrigation where limited quantity of water is applied at spot unlike surface irrigation methods. In surface irrigation fertilizers applied at spot can be distributed in root zone after dissolving it in irrigation water. Therefore, it is necessary to apply the fertilizer and manures where water is applied in drip irrigation *i.e.* below dripper.

MATERIALS AND METHODS

The present investigation was under taken with a view to study the effect of placement of fertilizers and manure under drip irrigation on soil health and economics of brinjal (*Solanum melongena* L.). The trial was conducted at the Department of Agronomy Farm, College of Agriculture, Dapoli during the *Rabi*-hot weather season, 2005-2006. The soil of the experiment field was clay loam in texture and medium acidic in reaction. It was medium in available nitrogen (326.30 kg ha^{-1}), low in available phosphorus (13.76 kg ha^{-1}) and moderately high in potassium (249.80 kg ha^{-1}). The experiment was laid out in Split Plot Design (Panse and Sukhatme, 1967) with twenty treatments replicated thrice. The gross and net plot sizes were 5.10 x 3.60 m^2 and 4.50 x 2.40 m^2, respectively. Two seedlings were transplanted at each spot, at 3-5 cm depth. The transplanting was done at the spacing 90 x 30 x 30 cm as to maintain the uniform plant population per hectare in all the plots. All the recommended management practices were followed. Chemical fertilizer were applied band placement along the rows, excavating a small pit of 10 cm depth below dripper, mixed fertilizer *i.e.* suphala (15:15:15) after dissolving in sufficient quantity of water, briquettes, soluble fertilizer (Aquafert 19:19:19) through drip system *i.e.* fertigation and poultry manure @ 5 tonnes ha^{-1} was applied, by excavating a small bands (shallow furrow) to the depth of 5 cm.

RESULTS AND DISCUSSION

It is revealed from the data presented in Table 1 that the available nitrogen and potassium in soil did not differ significantly due to placement of fertilizers. While the treatment RD through soluble fertilizer/urea (fertigation) recorded significantly superior value of available phosphorus over the treatment RDCF, band placement along the rows and RDCF below dripper, however, the former treatment was at par with the treatment RD through mixed fertilizer and urea below dripper and RD through NPK briquettes below dripper. Similar results were reported by Londhe (1982).

Further it was also reported that the treatment poultry manure band placement along the rows recorded significantly superior available nitrogen and phosphorus in soil over the rest of the treatments under study. It may be due to low yield and less uptake of nutrients by brinjal plant under these treatments, which retained more applied nutrients in the crop root zone. While the available

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Table 1 : Mean available N, P_2O_5 and K_2O in the soil as influenced by different treatments

Treatments	Available N (kg ha^{-1})	Available P_2O_5 (kg ha^{-1})	Available K2O (kg ha^{-1})
Placement of fertilizers			
F_1 - RDCF, band placement along the rows	310.74	16.22	219.21
F_2 - RDCF application below dripper	310.72	15.77	220.93
F_3 - RD through mixed fertilizer and urea below dripper	313.09	16.87	220.06
F_4 - RD through NPK briquettes below dripper	311.77	16.65	219.23
F_5 - RD through soluble fertilizer and urea (fertigation)	309.44	17.19	221.64
C.D. (P=0.05)	NS	0.62	NS
Placement of poultry manure			
M_1 - Band placement along the rows	318.63	17.01	218.85
M_2 - Band placement below lateral	313.63	16.40	218.69
M_3 - Placement below dripper	310.26	16.61	222.15
M_4 - Placement below hill	302.09	16.13	221.18
C.D. (P=0.05)	4.45	0.31	NS

NS-Non significant

Table 2 : Input cost, total cost, yield, gross income, net income and benefit cost ratio as influenced by different methods of placement of fertilizer and manure treatment combinations

Sr. No.	Treatments	Input cost (Rs ha^{-1})	Total cost (Rs ha^{-1})	Yield of fruit (t ha^{-1})	Gross income (Rs ha^{-1})	Net income (Rs ha^{-1})	Benefit cost ratio
1.	F_1M_1 - RDCF, band placement along the rows + poultry manure band placement along the rows	70,849	1,41,241	49.82	1,99,280	58,039	1.41
2.	F_1M_2 - RDCF, band placement along the rows + poultry manure placement below lateral	70,849	1,45,729	54.80	2,19,200	73,471	1.50
3.	F_1M_3 - RDCF, band placement along the rows + poultry manure placement below dripper	70,849	1,47,443	57.37	2,29,480	82,037	1.55
4.	F_1M_4 - RDCF, band placement along the rows + poultry manure placement below hill	70,849	1,53,902	67.06	2,68,240	1,14,338	1.74
5.	F_2M_1 - RDCF application below dripper + poultry manure band placement along the rows	70,849	1,52,536	65.01	2,60,040	1,07,504	1.70
6.	F_2M_2 - RDCF application below dripper + poultry manure band placement below lateral	70,849	1,52,616	65.13	2,60,520	1,07,904	1.71
7.	F_2M_3 - RDCF application below dripper + poultry manure placement below dripper	70,849	1,52,009	64.22	2,56,880	1,04,871	1.69
8.	F_2M_4 - RDCF application below dripper + poultry manure placement below hill	70,849	1,57,089	71.84	2,87,360	1,30,271	1.83
9.	F_3M_1 - RD through mixed fertilizer and urea below dripper + poultry manure band along rows	71,242	1,52,634	64.47	2,57,880	1,05,246	1.69
10.	F_3M_2 - RD through mixed fertilizer and urea below dripper + poultry manure placement below lateral	71,242	1,53,527	65.81	2,63,240	1,09,713	1.71
11.	F_3M_3 - RD through mixed fertilizer and urea below dripper + poultry manure placement below dripper	71,242	1,50,801	61.72	2,46,880	96,079	1.64
12.	F_3M_4 - RD through mixed fertilizer and urea below dripper + poultry manure placement below hill	71,242	1,55,194	68.31	2,73,240	1,18,046	1.76
13.	F_4M_1 – RD through NPK briquettes below dripper + poultry manure band placement along the rows	70,465	1,48,089	59.01	2,36,040	87,951	1.59
14.	F_4M_2 - RD through NPK briquettes below dripper + poultry manure placement below lateral	70,465	1,53,036	66.43	2,65,720	1,12,684	1.74
15.	F_4M_3 - RD through NPK briquettes below dripper + poultry manure placement below dripper	70,465	1,48,802	60.08	2,40,320	91,518	1.61
16.	F_4M_4 - RD through NPK briquettes below dripper + poultry manure placement below hill	70,465	1,52,602	65.78	2,63,120	1,10,518	1.72
17.	F_5M_1 – RD through soluble fertilizer and urea (fertigation) + poultry manure band placement along the rows	74,163	1,50,590	56.30	2,25,200	74,610	1.50
18.	F_5M_2 - RD through soluble fertilizer and urea (fertigation) + poultry manure placement below lateral	74,163	1,52,757	59.55	2,38,200	85,443	1.56
19.	F_5M_3 - RD through soluble fertilizer and urea (fertigation) + poultry manure placement below dripper	74,163	1,47,524	51.70	2,06,800	59,276	1.40
20.	F_5M_4 - RD through soluble fertilizer and urea (fertigation) + poultry manure placement below hill	74,163	1,48,357	52.95	2,11,800	63,443	1.43

potassium in the soil after harvest of crop did not differ significantly due to placement of poultry manure. These results are in line with the findings of Ramamoorthy and Velayutham (1978).

The data regarding the input cost, total cost, fruit yield, gross income, net income and benefit cost ratio of brinjal as influenced by different methods of application of fertilizers, methods of placement of poultry manure treatment combinations are presented in Table 2. The highest total cost of production of brinjal was observed in case of treatment combination RDCF, below dripper and poultry manure placement below hill (Rs. 1,57,089/-). The highest cost of production was associated with the higher gross returns which resulted into higher rental value of the land in comparison with other treatment combination. Similar findings were reported by Jadhav *et al.* (1990).

The highest gross income (Rs. 2,87,360/-) and net income (Rs. 1,30,271/-) was recorded by the treatment combination RDCF, below dripper and poultry manure placement below hill and the lowest gross income was recorded by the treatment RDCF, band placement along the row and poultry manure band placement along the row. The highest B:C ratio (1.83) was observed in treatment combination (1.83) of RDCF application below dripper and poultry manure placement below hill followed by treatment combination (1.76) of RD through mixed fertilizers and urea below dripper + poultry manure placement below hill. The quantity of water supplied to RDCF application below dripper and poultry manure placement below hill was 68.00 ha-cm. The water requirement for brinjal crop in check basin was 135 ha-cm (Shinde *et al.,* 2002). Drip irrigation saved about 49.63 per cent irrigation water that can be used for irrigating additional area under cultivation and thereby increasing overall productivity of the farm (Bankar, 1992).

In case of fruit yield of brinjal it was the highest in the treatment combination RDCF application below dripper and poultry manure placement below hill may be due to superior proper placement of fertilizers and manures with the application of water through drip irrigation resulted in higher fruit yield production of brinjal. It was reflected in higher net returns and B:C ratio of the crop. Similar finding were reported by Jadhav *et al.* (1990) and Londhe (1982).

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