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INTEGRATED NUTRIENT MANAGEMENT IN CARROT (*DAUCUS CARROTA* L.) UNDER NORTH EASTERN TRANSITIONAL TRACK OF KARNATAKA

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ABSTRACT
A field experiment was conducted at College of Horticulture, Bidar during *rabi* season consequently for three years (2009-2011) to study the INM in carrot. Among the different treatments, the application of 50% RDF + 25% N through FYM + 25% N through vermicompost recordedsignificantly higher rootyieldof carrot (24.10 t ha^{-1}) compared to rest of the treatments. The highest B: C ratio (7.77) was noticed in 100% RDF alone compared to other treatments. After three years of experiments on same site, combined usage of organic manure with inorganic fertilizers is not only help to improve the yield of carrot but also help in conserving the soil health.

INTRODUCTION

Vegetables that are produced by using organic manures are gaining importance because of less chemical residues and better taste. Considering the adverse effects on soil health and environment, besides the residual effects, luxurious usage of inorganic fertilizers is not advisable. Several scientists are advocating the integrated nutrient management with organic and inorganic fertilizers to conserve the soil health and to get good produce. Carrot (*Daucus carrota* L.) is one of the important and major root vegetable used as salad and cooked vegetable, besides; it is a rich source of beta carotene, which is a precursor of vitamin A (Chada, 2003). This is highly nutritious cool season root crop. It ranked third among the succulent vegetables in world production. It contains appreciable amount of carotene, thiamin, riboflavin and iron (Sharfuddin and Siddique, 1985). The crop is tolerant to pH of 5.5 to 6.5 and it requires a deep and well drained loamy soil with high amount of organic matter (Yayock *et al*., 1988). Carrot (*Daucus carrota* L.) is heavy feeder of nutrients and removes 100 Kg N, 50 Kg P_2O_5, and 180 Kg K_2O/ha (Schaller and Robber, 1985). The application of manures improves soil fertility and increases crop yield. It makes both macro and micro nutrients available to plants and also improves soil structure and enhances root growth. Manures also promote the activities of soil micro organisms which convert organic matter into humus and promote plant growth (Dupriez and De Leener, 1988). Therefore, judicious and proper use of organic manures and fertilizers is very essential not only for obtaining higher yield and quality produce but also to maintain soil health and sustainability for longer period. Considering these, we decided to generate the information on effect of INM system on carrot under red lateritic soils of North Eastern Transitional Track of Karnataka. Therefore, our aim was to evaluate the effect of organics like FYM and Vermicompost in conjunction with inorganic fertilizers on growth, yield and economics of the carrot.

MATERIALS AND METHODS

A field experiment was conducted at College of Horticulture, Halladakeri Farm, Bidar for a period of 3 years (2009-2010 to 2011-2012) during *rabi* season under irrigated conditions to study the integrated nutrient management in carrot under north eastern transitional track of Karnataka. The study area is 17^0 35′ and 18^0 2′ north latitude and 76^0 42′ and 77^0 39′ east longitude with an altitude of 630m above mean sea level. The carrot variety pusa yamadgni was used.

The experiment was laid out in RBD with 7 treatments having 3 replications. The soils were red sandy loam with low in available nitrogen (135kg ha^{-1}), phosphorous (12 kg ha^{-1}), potassium (118 kg ha^{-1}) with normal pH (6.7). The total seven treatments consist of T_1 – Control (No manure/No fertilizers),T_2- 100% RDF,T_3- 100% FYM,T_4- 100% Vermicompost,T_5- 50% RDF + 50% N through FYM,T_6- 50% RDF + 50% N through vermicompost,T_7- 50% RDF + 25% N through FYM + 25% N through vermicompost. The nitrogen was applied in two equal splits while P_2O_5 and K_2O were applied as basal at the time of sowing. The treatments consists of organic manures viz., FYM (25t/ha) and vermicompost (5t/ha) in combination with half the recommended dose of NPK (25:25:25 N:P_2O_5:K_2O Kg/ha) and full recommended dose (50:50:50 N :P_2O_5 :K_2O Kg/ha) applied as per the treatment. The seed was sown at the

spacing of 22.5 X 5cm. The irrigations were given by furrow method at 5 days interval. The data on the growth parameters was recorded from a sample of five plants at randomly at different intervals (20, 40, 60 and 80days). Yield parameters were recorded at harvest only. The data were statistically analyzed using standard statistical procedures according to Gomez and Gomez (1984).

RESULTS AND DISCUSSION

Growth and yield

The plant height in carrot was significantly influenced by different integrated nutrient management practices (Table 1). Among the different INM treatments, 50% RDF + 25% N through FYM + 25% N through vermicompost recorded significantly higher plant height (30.40cm) compared to rest of the treatments. Maurya and Goswamy (1985) were also reported a significant increase in plant height in carrot with the application of higher dose of N than its lower dose. The root growth in carrot was maximum (15.42cm) with 50% RDF + 25% N through FYM + 25%N through vermicompost compared to other treatments. It is attributed to the availability of more phosphorous and its slow release in this treatments coinciding with the stage of root development marked with increased root girth after cessation of root growth. Same results are obtained in onion by Naik *et al*. (2014) and Mangal (1985). Maximum root yield (24.10 t ha^{-1}) was observed with 50% RDF + 25% N through FYM + 25% N through vermicompost compared to rest of the treatments. This could be due to positive effect of plant height, root growth and root girth. Similar results were also reported by Sandya rani (1998), Jawadagi *et al*. (2012) and Praveenkumar (2000). The recommended dose of NPK alone performed better in improvement of carrot root yield. This might be due to increased and readily available nutrients and their uptake, which might have contributed to increased root length and root girth there by increased the root yield. Significantly lower root yield (7.83 t ha^{-1}) were recorded in control treatments. This might be attributed due to low fertility status of the soil. Application of 50% RDF + 50% N through FYM and 50% RDF + 50% N through vermicompost do not differ significantly in growth and yield parameters. Similar results were also reported by Sandya rani and Mallareddy (2007).

Economics of INM

The significantly highest B: C ratio (7.77) was noticed in case of 100% RDF treatments compared to rest of treatments due to higher cost of organic inputs and also due to organic manures requirements were also more to meet the nutrients requirements of the carrot (Table 2). However, the treatments like 100% FYM and 100% vermicompost, 50% RDF + 50% N through FYM and 50% RDF + 25% N through FYM + 25% N through vermicompost do not differe significantly with respect to B: C ratio. The Lowest B:C ratio was noticed in case of control. These results are in conformity with Sandya rani and Mallareddy (2007).

From these studies, theapplication of 50% RDF + 25% N through FYM + 25% N through vermicompost recorded significantly higher yield compared to other treatments. The application of 100% RDF alone adversely affects the soil heath;it is not advisable to use synthetic fertilizer in higher quantities.The combined usage of organic manure with inorganic fertilizers not only helps to improve the yield of carrot but also help in improving the soil health.

Table 1: Effect of integrated nutrient management on growth and yield of carrot at harvest (Pooled: 2009-11)

Treatments	Plant Height (cm)	Root growth (cm)	Root girth (cm)	Root Yield (t/ha)
T_1 – Control (No manure/No fertilizers)	23.88	10.42	6.53	7.83
T_2- 100% RDF	30.10	15.00	9.93	23.38
T_3- 100% FYM	28.50	13.80	8.38	19.36
T_4- 100% Vermicompost	27.95	14.15	8.37	19.52
T_5- 50% RDF + 50% N through FYM	30.20	15.38	10.30	23.63
T_6- 50% RDF + 50% N through vermicompost	29.87	15.42	10.20	23.60
T_7- 50% RDF + 25% N through FYM + 25% N through vermicompost	30.40	15.42	10.40	24.10
S Em ±	0.110	0.042	0.043	0.068
CD(P = 0.05)	0.338	0.128	0.134	0.209

Table 2: Economics of integrated nutrient management in carrot

Treatments	Cost of cultivation	Gross income (Rs.ha^{-1})	Net income (Rs.ha^{-1})	B:C ratio
T_1 – Control (No manure/No fertilizers)	12862	46980	34118	2.65
T_2- 100% RDF	15994	140280	124286	7.77
T_3- 100% FYM	21862	116160	94298	4.34
T_4- 100% Vermicompost	21862	117120	95258	4.35
T_5- 50% RDF + 50% N through FYM	20737	141780	121043	5.85
T_6- 50% RDF + 50% N through vermicompost	21437	141600	120163	5.60
T_7- 50% RDF + 25% N through FYM + 25% N through vermicompost	20862	144600	123738	5.93
SEm ±				0.054
CD(P = 0.05)				0.167

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Cont. ..... P. 278