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EFFECT OF COMBINED APPLICATION OF DIFFERENT NUTRIENT SOURCES ON GROWTH AND YIELD ATTRIBUTING CHARACTERS IN ONION cv. N-53

Archana Dikshit

Department of Horticulture, Indira Gandhi Krishi Vishwavidyalaya, Raipur - 492 012 (Chhattisgarh), India.
E-mail-archieshine@gmail.com

Onion is a heavy feeder of mineral nutrients and it is reported that a crop of 35 tonnes of onion removes approximately 120 kg N, 50 kg P_2O_5 and 160 kg K_2O ha^{-1}. An adequate and uniform supply of nutrients particularly nitrogen is essential for plant growth, and bulb yield (Tandon, 1987). Among the many constraints for low productivity in onion, imbalanced nutrition is the main limiting factor. Greenland (1975) suggested that for a sustainable crop production system, chemical nutrients removed by the crop must be replenished and physical conditions of the soil maintained. Integrated nutrient management (INM) provides excellent opportunities to overcome all the imbalances besides sustaining soil health and enhancing crop production. The present study was undertaken to see the integrated effect of organic manures. biofertilizers and chemical fertilizers on growth and yield of *rabi* onion cv.N-53.

The experiment was conducted during rabi, 2012-13 in Department of Vegetable Science, OUAT, Bhubaneswar (Odisha), India; in onion cv. N-53. The experiment was conducted in RBD design with ten treatments and three replications. Ten plants from each plot were selected randomly and tagged for recording growth parameters like plant height, number of leaves, Leaf length, leaf width, neck length and yield parameters *viz.,* bulb yield and bulb weight were recorded from the plants used for recording observations. The bulb yield per hectare was worked out based on the plot yield. The analysis and interpretation of data were done using the Fisher's method of analysis of variance technique as described by Gomez and Gomez (1984).

Nursery beds of 1m width, 3m length and 15 cm height were prepared and thoroughly mixed with FYM @ 5kg per bed along with NPK mixture @ 100 g per bed. After levelling seeds were sown in lines drawn at a distance of 5cm. The seeds of cv. N-53 were sown in second week of October in the nursery. The beds are then watered with rose can. Seeds sprout 7 days after sowing and seedlings were thinned later to a distance of about 1cm between them.The seedlings were transplanted in the last week of November at a spacing of 15 cm × 10 cm. Recommended dose of FYM was applied to all the treatments @ 25 tonnes per ha. Six weeks old healthy seedlings were dipped in cow dung slurry with a mixed culture of biofertilizers *i.e.*, *Azotobacter*, *Azospirillum* and P-solubilizing bacteria @ 4 kg per ha each. The crop was fertilized with recommended dose of fertilizers @ 120:60:60 kg NPK per ha in the form of urea, DAP and muriate of potash, respectively. Vermicompost was applied @ 5t per ha at the time of final land preparation. The growth and yield parameters were estimated in field conditions by randomly selection of ten plants from each plot.

The data with respect to plant growth characters as influenced by various inorganic and organic integrated nutrient treatments (table 1) revealed that maximum plant height (51.44 cm) was recorded in $\mathbf{T_9}$, which was significantly superior to all other treatments including control ($\mathbf{T_1}$). Increase in plant height as well as leaf number may be due to higher metabolic activity because of optimum N application resulting in higher production of carbohydrates and phytohormones, which were manifested in the form of enhanced growth. Production of growth promoting substances and vitamins by vermicompost and biofertilizers and their effect on plant growth was reported by Subbiah (1994) and Motsara *et al.* (1990). Maximum number of leaves, leaf length and leaf width was recorded with $\mathbf{T_9}$ (14.11), (43.25 cm) and (1.97 cm), respectively and was significantly different from rest of the treatments. Increase in leaf number per

Table 1 : Effect of combined application of different nutrient treatments on growth and yield attributing characters of onion cv. N-53.

Treatments	Plant height (cm)	Number of leaves	Leaf length (cm)	Leaf width (cm)	Neck length (cm)	Fresh weight of bulb (g)	Bulb yield (t ha^{-1})
T_1 : L_0 + BF_0 + VC_0 + RDF_0	29.68	6.90	25.09	1.11	58.76	11.50	11.50
T_2 : RDF	38.42	10.98	34.60	1.51	88.33	16.67	16.67
T_3 : L + BF	32.89	8.04	27.34	1.25	71.07	12.77	12.77
T_4 : L + VC	31.45	8.34	27.09	1.39	84.41	13.80	13.80
T_5 : L + RDF	43.39	11.34	37.15	1.55	98.68	20.75	20.75
T_6 : L + BF + VC	35.49	10.11	33.61	1.35	79.88	13.60	13.60
T_7 : L + BF + RDF	46.78	11.01	39.47	1.87	111.89	23.52	23.52
T_8 : L + VC + RDF	47.36	12.09	40.15	1.77	111.84	24.10	24.10
T_9 : L + BF + VC + RDF	51.44	14.11	43.25	1.97	128.53	27.13	27.13
T_{10}: L_0 + BF + VC + RDF	41.30	11.88	38.33	1.44	91.44	17.44	17.44
S.E.m ±	0.86	0.42	0.90	0.14	5.63	5.63	0.81
C.D. (P=0.05)	2.55	1.25	2.66	0.42	16.72	16.72	2.41

T_1- No application of fertilizers (control); **T_2**- RDF; **T_3** - Lime + Biofertilizers (*Azotobacter* + PSB + *Azospirillum*); **T_4** - Lime + Vermicompost; **T_5** - Lime + RDF (100 %), **T_6** - Lime + Biofertilizers (*Azotobacter* + PSB + *Azospirillum)*+ Vermicompost, **T_7** - Lime + Biofertilizers (*Azotobacter* + PSB + *Azospirillum*) + RDF (100%), **T_8** - Lime + Vermicompost + RDF (100%), **T_9** - Lime + Biofertilizers (*Azotobacter* + PSB + *Azospirillum*) + Vermicompost + RDF (100%), **T_{10}** - Biofertilizers (*Azotobacter* + PSB + *Azospirillum*) + Vermicompost + RDF (100%).

plant with increase in N level in onion was reported by Kumar et *al*. (1998). Jilani (2004) reported that application of higher amount of nitrogen significantly enhanced the length of onion leaves. Maximum neck length was recorded in **T_9** (2.17 cm), which was significantly superior than other treatments including control followed by **T_8** (1.13 cm) and **T_4** (1.11 cm). This might be due to increased number of leaves per plant resulting in better photosynthesis and accumulation of photosynthates leading to more vigour. Similar results were also reported by Setty (1988) in Garlic and Thimmiah in Onion (1989).

The data presented in table 1 with respect to yield-attributing characters as influenced by various inorganic and organic integrated nutrient treatments revealed that maximum bulb weight was recorded in **T_9** (128.53 g), which was significantly higher than the rest of the treatments. The organic treatment of vermicompost might have increased the soil organic matter, soil structure and biological activity of the soil and ultimately reduced the loss of nitrogen by increased cation and anion exchange capacity in soil. Maximum yield (27.13 t ha^{-1}) was recorded with the application of 100% recommended dose of chemical fertilizers with biofertilizers, vermicompost and lime, which was significantly higher than other treatments including control. The minimum marketable yield was recorded under **T_1** (11.50 t ha^{-1}), which happens to be control. The increase in crop growth rate such as plant height and number of leaves might have positive and significant correlation with the yield. At higher level of organics,improved soil physical conditions might have resulted in better root growth, nutrient absorption and better bulb development. Increased bulb yield were noticed by several workers *viz*., Varu *et al.* (1997) and Singh *et al.* (1997) with increased vermicompst levels. It might be due to increased net assimilation rate leading to production of more amount of metabolites and phytohormones followed by their mobilization from source to sink which ultimately resulted in higher yield as also reported by number of workers (Neerja *et al*., 2001; Thilkawati and Ramaswami, 1998; Jayathilake *et al*., 2003) in onion.

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