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Effect of Organic Manures and Biofertilizers on Yield and Nutrient Composition of Onion

AVITOLI K. YEPTHO, A. K. SINGH[1], S. P. KANAUJIA AND V. B. SINGH

Department of Horticulture, [1]Department of Agricultural Chemistry & Soil Science School of Agricultural Sciences and Rural Development Nagaland University, Medziphema 797106, Nagaland, India

Abstract

Field experiments were carried out during 2006 and 2007 to study the effect of organic manures and biofertilizers on yield and nutrient composition of kharif onion. The experiments were laid out in randomized block design with nine treatments and three replications. Treatments comprised T_1 : Control, T_2 : FYM at 40 t/ha, T_3 : Pigmanure at 30 t/ha, T_4 : Vermicompost at 10 t/ha, T_5 : Poultry manure at 20 t/ha, T_6 : FYM + *Azotobacter*, T_7 : Pigmanure + *Azotobacter*, T_8 : Vermicompost + *Azotobacter*, T_9 : Poultry manure + *Azotobacter*, Results revealed that application of Poultry manure + *Azotobacter* gave the highest bulb yield (203.33 q/ha^{-1}). Higher concentration of N in both leaf (1.16%) and bulb (1.02%) was recorded in treatment T_9 (poultry manure + *Azotobacter*), whereas maximum P content in leaf (0.34%) and bulb (0.46%) was recorded in treatment T_8 (vermicompost + *Azotobacter*). Maximum content (1.68%) in leaf was recorded in vermicompost + *Azotobacter* treatment. However, potassium content in bulb was not influenced significantly.

Key words : *Kharif* onion, Organic manures, Biofertilizers, Yield, Nutrient composition.

Onion (*Allium cepa* L.) is an important vegetable and spice crop. Most of the onion varieties are grown as winter crop in the plains of India and contributes 70% of total produce. *Kharif* season accounts only 30% of the production. Rainy season varieties require long days and high temperature throughout the growing season. Onion grows during *rabi* season mainly accounts for the bulk of the market supply, hence its price soar during *kharif* season due to less supply and more demand. To meet the increasing demand, emphasis is being laid on growing onion in *kharif* season (Saraf 2007). Preliminary experiments have opened the scope of growing off season onion during *kharif*, which could be harvested during the highest pricing period of onion (November—January) under Nagaland condition (Singh 2006).

The fertilizer consumption in Nagaland is less and onion requires substantial quantity of plant nutrients. Organic manures alone or in combination may serve the source of manuring in eco-friendly manner. Use of organic manures for plant nutrition helps in mitigating multiple nutrient deficiencies, Addition of organic manure to acidic soils reduces the soluble and exchangeable aluminum temporarily by forming complexes with organic matter and provides favorable environment for plant growth in addition to improvement in the physical, chemical and biological properties of soil (Patiram 1996). Now-a-days emphasis is being given on application of biofertilizers which play significant role in plant nutrition. Inoculation of biofertilizers increased the yield of onion and saved about 25% of nutrients demand thereby reduced the cost of cultivation Thilakauathy and Ramaswamy (1999). In view of this, field experiments were conducted to study the effect of organic manures and biofertilizers on yield and nutrients composition of *kharif* onion under foothills of Nagaland.

Methods

Field experiments were conducted at Experimental Farm of the School of Agricultural Sciences and Rural Development, Nagaland University, Medziphema Campus during 2006 and 2007 (August—December). Medziphema is situated at an altitude of 304.8 m above mean sea level and geographically located at 25° 45´ 43´´ N latitude and 9° 53´ 04´´ E longitude in the foot hills of Nagaland. The soil of the

Table 1. Effect of organic manures and biofertilizers on bulb yield and nutrient composition of *kharif* onion.

Treatments	Weight of bulb (g)	Yield (q/ha)	Nutrient composition in leaves			Nutrient composition in bulb		
			N	P	K	N	P	K
T_1 Control	40.49	73.18	0.79	0.22	1.06	0.74	0.30	1.71
T_2 FYM 40 t/ha	69.41	154.44	1.02	0.29	1.34	0.94	0.43	2.28
T_3 Pig manure 30 t/ha	60.61	118.42	0.87	0.25	1.51	0.86	0.39	2.29
T_4 Vermicompost 10 t/ha	64.65	125.92	0.98	0.28	1.64	0.78	0.44	2.37
T_5 Poultry manure 20 t/ha	78.80	197.76	1.12	0.31	1.45	0.98	0.45	2.30
T_6 FYM + *Azotobacter*	70.05	158.28	1.02	0.30	1.38	0.98	0.41	2.31
T_7 Pigmanure + *Azotobacter*	60.18	122.18	0.91	0.29	1.55	0.92	0.38	2.23
T_8 Vermicompost + *Azotobacter*	64.51	134.81	1.02	0.34	1.68	0.84	0.46	2.31
T_9 Poultry manure + *Azotobacter*	81.31	203.33	1.16	0.32	1.47	1.02	0.45	2.34
CD at 5%	6.37	14.06	0.16	0.05	0.32	0.13	0.05	NS

experimental site was sandy loam, well drained having pH of 4.5, organic carbon 2.0%, available N 212.3, P_2O_5 10.5 and K_2O 173.2 kg/ha. The experiments were laid out in randomized block design with nine treatments and three replications with a plot size of 1.5 ×1.5 m. Treatments comprised T_1 : Control, T_2 : FYM at 40 t/ha, T_3 : Pigmanure at 30 t/ha, T_4 : Vermicompost at 10 t/ha, T_5 : Poultry manure at 20 t/ha, T_6 : FYM +*Azotobacter,* T_7 : Pigmanure + Azotobacter, T_8 : Vermicompost + *Azotobacter*, T_9 : Poultry manure +*Azotobacter*. Organic manures i.e. FYM, pig manure, poultry manure and vermicompost were incorporated at the final stage of field preparation as per treatment. The bulblets were dipped thoroughly in *Azotobacter* slurry then kept in shade for drying. The bulblets of cv Agrifound Dark Red each weighing about 15—20 g were planted on 30 August at the spacing of 20 × 15 cm in both the years. Observations on the bilb weight and yield were recorded. The leaf and bulb samples were dried. The oven dried samples of bulb and leaf were grinded. Nitrogen, phosphorus and potassium were estimated following standard procedure (Jackson 1969). The result thus obtained was represented in terms of percentage on dry weight basis. The statistical analysis was carried out following procedure given by Panse and Sukhatme (1978).

Results and Discussion

The different treatments significantly affected the weight of bulb (Table 1). The treatment T_9 (poultry manure + *Azotobacter*) caused maximum weight of bulb (81.31 g) and significantly superior to most of the treatments except T_5 (poultry manure at 20 t/ha) where it statistically remained at par. The application of FYM at 40 t/ha in combination with *Azotobacter* proved next best treatment with regard to weight of bulb. Minimum weight of bulb (40.49 g) was recorded in T_1 (control). The result of bulb yield revealed that there was a significant variation in bulb yield among the treatment studied (Table 1). The highest yield of 203.33 q/ha was recorded in treatment T_9 (poultry manure + *Azotobacter*). However, it remained statistically at par with treatment T_5 (poultry manure at 20 t/ha). The different treatments caused to increase the bulb yield from 37.84—64% over control. FYM at 40 t/ha application alone and in combination proved to be second best treatment followed by vermicompost and pig manure. Minimum bulb yield (73.18 q/ha) was recorded in T_1 (control). The increase in the bulb yield might be due to favorable conditions created by poultry manure. Poultry manure. Poultry manure mixed readily with the soil and liberated nutrients in balanced ratio resulted in enhanced yield of onion (Ngullie et al. 2008). The present investigation are in close conformity with the work carried out by Khalif et al. (2002) who recorded that chicken manure was more effective compared to FYM in increasing the growth and bulb yield.

The different treatments significantly affected nutrient composition of leaf and bulb. Higher concentration of N in both leaf (1.16%) and bulb (1.02%) was recorded from treatment T_9(poultry manure + *Azotobacter*). Whereas, maximum P content in leaf (0.34%) and bulb (0.46%) was recorded from treatment T_8 (vermicompost + *Azotobacter*). The leaf po-

tassium content (1.68%) also significantly affected by treatment T_8 (vermicompost + *Azotobacter*) but K content in bulb was not influenced significantly. In general nutrient accumulation was found to enhance by application of biofertilizers along with manures. Thilakavathy and Ramaswamy (1999) observed the favorable effect of *Azospirillum* and *Phosphobacteria* in nutrient accumulation of onion. Khalif et al. (2002) recorded higher P content in onion with application of chicken manure.

Thus it can be concluded that combined use of poultry manure and *Azotobacter* would be a sound practice for higher yield and nutrient composition of *kharif* onion under foot hills of Nagaland.

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