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Effect of INM in Onion (*Allium cepa* L.) with Respect to Growth and yield under North Gujarat Condition

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A B S T R A C T

The present investigation entitled, "Integrated nutrient management in onion (*Allium cepa* L.) With respect to growth, yield and quality under North Gujarat condition" was carried out during *rabi* season of 2014-2015 at Horticulture Instructional Farm, C. P. College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar. The growth parameters *viz.*, maximum plant height (43.81cm and 70.46 cm) and neck thickness (1.53 cm and 2.45 cm) were recorded with treatment T_2 at 45 and 90 DAT respectively whereas; maximum number of leaves (10.52) was recorded with same treatment at 90 DAT. The same trends were followed in yield and yield parameters *viz.*, maximum weight of bulb (123.52 g), total bulb yield (19.94 kg/plot and 568.14 q/ha) and marketable yield (17.51 kg/plot and 499.00 q/ha) were recorded with treatment T_2. Whereas minimum unmarketable yield of bulb (1.74 kg/plot and 49.66q/ha) was observed with the treatment T_3 and minimum bolting percent (3.30) was obtained under treatment T_6 and T_7.

Introduction

Onion (*Allium cepa* L.) is one of the oldest bulb crop consumed worldwide. It is one of the most important commercial vegetable crops grown in India and believed to be originated in Central Asia. It is valued for its distinct pungent flavour and is an essential ingredient for the cuisine of many regions. Onion is the queen of the kitchen (Selvaraj, 1976). The onion is preferred mainly because of its green leaves, immature and mature bulbs are either eaten raw or cooked as a vegetable. Mild flavoured and low pungent bulbs are often chosen for salads. The bulbs are used in soups, sauces, condiments, spices, medicines, seasoning of many foods and for the preparation of value added edible products like powder and flakes. A distinct characteristic of onion is its alliaceous odour, which accounts for their use as food. The pungency in onion is due to a volatile compound allyl propyl disulphide.

Onion has many uses as folk medicine and recent reports suggest that onion plays an important role in preventing heart diseases and other ailments. It is one of the richest sources of flavonoids which reduce risk of cancer, heart disease and diabetes. Flavonoids are not only anti-cancer but also known anti-bacterial, antiviral and anti-allergenic. Onion contains 11 amino acids. Hundred gram of raw onion bulb contains about moisture 86.8 g, carbohydrate 11.0 g, protein 1.2 g, fibre 0.6 g, minerals 0.4 g, thiamine 0.08 mg, vitamin c 1 mg, calcium 180 mg, phosphorus 50 mg and riboflavin 0.01 mg which make up the dry matter of the bulb (Boss *et al.,* 2003). Onion is mainly cultivated as a *rabi* crop, however it is also raised as *kharif* in Maharashtra and Gujarat to catch off-season market.

Onion is a highly nutrient responsive crop. Conventional methods of fertilization have undoubtedly helped in improving both bulb yield and quality. But lately, routine management practice appears to be incapable of maintaining yields over the long-term. The steady depletion of native soil fertility and the occurrence of multiple nutrient deficiencies in onion fields have led to the identification of nutrient management as a key factor limiting sustainable onion production. Integrated nutrient management (INM) offers an effective strategy (Dimri and Singh, 2005). A gradual shift from using purely organic sources to introducing some proportion of inorganic fertilization is gaining acceptance. This shift has formed the basis for INM, which could involve two nutrient sources: inorganic fertilizer and manures. However, INM further prescribes that selected nutrient inputs be used judiciously to ensure optimum supply of all essential nutrients for sustained crop production.

The organic vegetable industry is flourishing due to consumer preference organically produce over traditionally grown vegetables as a result an increase in varieties and selection of many vegetables in retail, supermarket and restaurants.

Materials and Methods

The experiment was conducted at Horticulture Instructional Farm, Department of Horticulture, Chimanbhai Patel College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, Gujarat during the *rabi* season of the year 2014-15. Healthy uniform seedlings having about 15-20 cm height were used and transplanting was done at last week of December with spacing of 15 cm × 10 cm in.

The details of the treatments and treatment wise application of organic manures and inorganic fertilizers (kg/ha) are given in Table 1 and Table 2. All the treatments were laid out in randomized block design with three replications under drip irrigation.

Impact of organic manures i.e. FYM, Vermicompost and Poultry Manure along with nitrogen on growth, yield and qualitative character of onion (Cultivar Agrifound Light Red). The soil of the experimental field was loamy sand texture with pH 7.8, EC 0.16 dSm^{-1}, Available N 215 kg/ha, Available P_2O_5 37.11 kg/ha and Available K_2O 185 kg/ha. The recommended amount of nitrogen (100 kg N/ha) was applied in four splits i.e. one fourth was applied as basal and the remaining dose of N was applied 30,45 and 60 days after planting. Plant height was measured at 45 and 90 days after transplanting by using scale method and average of ten tagged plants was worked out. Number of leaves per plant was measured at45 and 90 DAT. Bulb diameter and neck thickness was measured by using Verniear caliper. Bulb weight and bulb yield was measured at harvesting stage and yield was calculated as marketable and unmarketable basis. The bulbs were harvested

on maturity when 50-70 % percent neck fall stage. The number of bolters were counted from each treatment and worked out in per cent.

Results and Discussion

The results obtain from the present investigation on the Evaluation of different treatments in onion (*Allium cepa* L.) under North Gujarat condition during *Rabi* 2014-15 are discussed given below.

Growth parameters

In the study of all the growth parameters *viz.*, maximum plant height, number of leaves and neck thickness were recorded at the deferent stages i.e. 45 and 90 DAT.

Among all the treatments, significantly maximum plant height (cm) at 45 and 90 DAT, number of leaves at 90 DAT and neck thickness (cm) at 45 and 90 DAT were recorded with the treatment T_2 (125 kg/ha N + 50kg P and K + FYM 20 t/ha) (Table 3).

Table.1 Details of the treatments used for present investigation

Sr.No.	Tr. No.	Treatments detail
1	T_1	100% NPK as per recommendation (100:50:50) + FYM 20 t/ha
2	T_2	125 kg/ha N + 50kg P and K + FYM 20 t/ha
3	T_3	50% (50kg) recommended dose of N through FYM and 50% (50 kg) recommended dose of N through chemical fertilizer.
4	T_4	50 % (50 kg) recommended dose of N through vermicompost and 50% (50 kg) recommended dose of N through chemical fertilizer.
5	T_5	50% (50 kg) recommended dose of N through poultry manure and 50% (50 kg) recommended dose of N through chemical fertilizer.
6	T_6	100% (100 kg) recommended dose of N through FYM.
7	T_7	100% (100 kg) recommended dose of N through vermicompost.
8	T_8	100% (100 kg) recommended dose of N through poultry manure.
9	T_9	125 kg/ha N through FYM
10	T_{10}	125 kg/ha N through vermin-compost
11	T_{11}	125 kg/ha N through poultry manure

Table.2 Treatment wise application of organic manures and inorganic fertilizers (kg/ha)

Treatment No.	Required quantity (kg/ha)					
	FY M	Vermi compost	Poultry manure	Urea	SSP	MOP
T1	20,000			217.39	312.5	83.33
T2	20,000			271.74	312.5	83.33
T3	9613			108.79	312.5	83.33
T4		2933		108.79	312.5	83.33
T5			2177	108.79	312.5	83.33
T6	19228				312.5	83.33
T7		5866			312.5	83.33
T8			4222		312.5	83.33
T9	24022				312.5	83.33
T10		7333			312.5	83.33
T11			5422		312.5	83.33

Table.3 Effect of integrated nutrient management on growth parameters on onion

Sr. No.	Treatment. No.	Plant height (cm) at 45 DAP	Plant height (cm) at 90 DAP	Number of leaves at 45 DAT	Number of leaves at 90 DAT	Neck thickness At 45 DAT(cm)	Neck thickness At 90 DAT(cm)	Days taken for maturity	Bolting per cent
1.	**T_1**	42.30	67.12	6.20	9.84	1.32	2.32	124.00	3.43
2.	**T_2**	43.81	70.46	**6.73**	**10.52**	1.53	2.45	123.00	4.30
3.	**T_3**	33.20	59.46	6.07	9.12	0.98	1.82	125.67	3.87
4.	**T_4**	34.64	60.01	6.53	9.77	1.07	1.71	125.67	4.03
5.	**T_5**	35.17	64.26	5.83	9.35	0.87	1.99	124.33	3.93
6.	**T_6**	28.70	57.62	5.63	9.45	0.79	1.80	124.67	3.30
7.	**T_7**	29.12	60.34	6.07	9.14	0.98	2.12	123.67	3.30
8.	**T_8**	30.27	61.18	6.10	9.17	0.93	1.70	125.33	4.25
9.	**T_9**	31.00	60.65	6.00	9.82	0.74	1.59	124.67	4.70
10.	**T_{10}**	33.51	64.12	5.57	9.66	0.77	1.48	124.33	4.03
11.	**T_{11}**	35.23	65.39	5.90	9.38	0.86	1.68	124.67	4.60
12.	S.Em. ±	1.49	2.48	0.25	0.27	0.058	0.08	1.16	0.293
13.	C.D. (P = 0.05)	4.39	7.33	NS	0.80	0.17	0.24	NS	0.87
14.	C.V. %	7.53	6.86	7.19	4.90	10.19	7.38	1.79	12.78

Table.4 Effect of integrated nutrient management on yield parameters on onion with BC ratio

Sr. No.	Treatment. No.	Weight of bulb (g)	Total bulb yield (kg/plot)	Total bulb yield (q/ha)	Marketable yield of bulb (kg/plot)	Unmarketable yield of bulb (kg/plot)	Marketable yield of bulb (q/ha)	Unmarketable yield of bulb (q/ha)	Benefit Cost Ratio
1.	**T_1**	114.06	17.67	503.44	15.59	2.08	444.13	59.29	5.33
2.	**T_2**	123.52	19.94	568.14	17.51	2.42	499.00	69.03	5.98
3.	**T_3**	104.83	15.45	440.03	13.71	1.74	390.46	49.66	5.38
4.	**T_4**	107.99	15.72	448.00	13.92	1.81	396.45	51.61	5.11
5.	**T_5**	111.52	17.05	485.63	15.04	2.00	428.55	57.09	5.80
6.	**T_6**	88.97	14.67	418.09	12.64	2.04	360.03	58.06	4.39
7.	**T_7**	96.26	15.13	431.11	13.19	1.94	375.84	55.30	4.09
8.	**T_8**	94.49	15.84	451.38	13.81	2.03	393.57	57.81	4.69
9.	**T_9**	101.35	15.53	442.33	13.43	2.09	382.67	59.65	4.41
10	**T_{10}**	111.52	16.89	481.30	14.62	2.27	416.57	64.65	4.19
11	**T_{11}**	112.84	17.44	496.85	15.48	1.96	441.13	55.74	4.91
12	S.Em. ±	4.62	0.98	27.91	0.90	0.11	25.65	3.24	-
13	C.D. (P=0.05)	13.63	2.89	82.33	2.66	0.34	75.66	9.56	-
14	C.V. %	7.54	10.29	10.29	10.79	9.72	10.79	9.68	-

Among all the treatments, minimum bolting per cent was obtained under treatment T_6 (100% (100 kg) recommended dose of N through FYM) and T_7 (100% (100 kg) recommended dose of N through vermicompost). These findings are in accordance with Farooqui *et al.*, (2009), Nori *et al.*, (2012) and Nainwal *et al.*, (2015).

Yield and yield parameters

In the study of all the yield parameters *viz.*, weight of bulb, total bulb yield per plot, total bulb yield per hectare, marketable and unmarketable yield of bulb per plot and marketable and unmarketable yield of bulb per hectare were recorded under the yield and yield parameters (Table 4).

Among all the treatments, significantly maximum weight of bulb (g), total bulb yield (kg/plot and q/ha) and marketable yield of bulb (kg/plot and q/ha) were recorded with treatment T_2 (125 kg/ha N + 50 kg P and K + FYM 20 t/ha). Among all the treatments, minimum unmarketable yield of bulb (kg/plot and q/ha) was recorded with treatment T_3 (50% (50 kg) recommended dose of N through FYM and 50 % (50 kg) recommended dose of N through chemical fertilizer) These findings are in accordance with Farooqui *et al.*, (2009), Nori *et al.*, (2012), Jamir *et al.*, (2013) and Nainwal *et al.*, (2015)

The experimental evidences warrant the following specific conclusion which may be adopted for profitable cultivation of onion. On the basis of results of the present investigation, it could be concluded that nutrient management in onion is very efficient. Application of 125 kg/h N +50 kg P and K + FYM 20 t/ha should be applied for getting higher yield and economic return for North Gujarat Agro-climatic zone.

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