

Research Note :**GROWTH ATTRIBUTES OF KHARIF ONION (*Allium cepa* L.) AS INFLUENCED BY COMBINATION OF ORGANIC AND INORGANIC NUTRIENTS**Joydip Mandal^{1*}, Arun Sharma¹ and Subrata Mandal^{2*}¹Department of Crop Improvement, Horticulture and Agricultural Botany (CIHAB),²Rathindra Krishi Vigyan Kendra,

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ABSTRACT : An experiment was conducted at the Horticulture Farm of Institute of Agriculture, Sriniketan (West Bengal) to find out the effect of different levels of organic and inorganic nutrients on growth of onion during Kharif, 2014. Seven treatment combinations (FYM, Mustard cake and NPK) were arranged in complete randomized block design with three replications. The data on plant height, number of leaves /plant, leaf length, leaf diameter, neck length and neck diameter were recorded at 30, 60, 90 and 120 days after transplanting. Different combinations of organic and inorganic nutrients had significant influence on different growth attributes. Treatment combination of 20 t/ha FYM + State recommended NPK (125-100-100 kg/ha) was performed better than others in all the growth parameters, except neck length.

Keywords : Onion, FYM, mustard oil cake, NPK, growth.

Onion (*Allium cepa* L. 2n=16) is an important bulb crop belonging to family Alliaceae. It is an indispensable item in every kitchen as vegetable and condiment used to flavour many of the food stuffs. In addition, onion is used as salad and pickle, and also in processing industry to greater extent for preparing dehydrated forms like powder and flakes. Onion is major vegetables crop which has been high domestic demand in West Bengal. It is generally grown in *rabi* season in West Bengal and the bulbs are available from April onwards. However, *rabi* crop cannot stored beyond October which increase the market price to greater extent. The state has to depend on the other states that produced *kharif* onion for supply the bulbs during October to March. Cultivation of onion locally during *kharif* season may play a crucial role to meet this demand supply gap and thereby stabilize the price rise of onion. Due to Government exercise on *kharif* onion, its cultivation is slowly getting momentum and all the onion stockholders are reaping the benefits. During this exercise shortfall of technology related to the cultivation of *kharif* onion has been realized. In production technology, nutrient management plays an important role for getting better growth and yield. Thus, it felt necessary to develop suitable nutrient management practices for the *kharif* onion growers of West Bengal. Keeping the above points in mind a research work was formulated with the objective to find out the effect of different levels of organic and inorganic

fertilizers on growth of onion under Red and Laterite Zone of West Bengal.

The experimental site was situated in the sub-humid, subtropical lateritic belt of West Bengal that experiences the hot summer and moderately cold and short winter. The experiment was conducted at the Horticulture Farm of Palli Siksha Bhavana (Institute of Agriculture), Visva-Bharati, Sriniketan (West Bengal) during *Kharif*, 2014. The experiment was laid out in complete randomized block design with three replications. There were seven treatment combinations viz. T₁ = Farmers practice *i.e.* 7.5 t/ha FYM + NPK (115-40-75 kg/ha), T₂ = 7.5 t/ha FYM + State recommended NPK (RDF) *i.e.* 125-100-100 kg/ha, T₃ = 7.5 t/ha FYM + Soil test based NPK (STF) *i.e.* 156-100-75 kg/ha, T₄ = 20 t/ha FYM + RDF, T₅ = 20 t/ha FYM + STF, T₆ = 10 t/ha FYM + Mustard Oil Cake (1t/ha) + RDF and T₇ = 10 t/ha FYM + Mustard Oil Cake (1t/ha) + STF. According to initial soil NPK status of the experimental plot, T₃, T₅ and T₇ treatments received 25% higher nitrogen dose than recommended, equal phosphorus dose as recommended and 25% less potash dose than recommended. The plot size was kept 4 m x 1.2 m. Seed sowing of onion cv. Agrifound Dark Red was done on 20th June 2014 and 45 days old seedlings were transplanted in the main field at a spacing of 15 cm x 10 cm on 5th August 2014. Different dose of FYM, phosphorus and potassium (according to treatment) were applied before transplanting. Nitrogen

Table 1. Effect of organic and inorganic nutrient on plant height and number of leaves/plant.

Treatment	Plant height (cm)				No. of leaves/plant			
	30 DAT	60 DAT	90 DAT	120 DAT	30 DAT	60 DAT	90 DAT	120 DAT
T ₁	16.4	25.9	37.0 ^d	47.1 ^c	3.1	3.6	6.0 ^c	7.8 ^c
T ₂	20.0	32.6	45.6 ^{abc}	52.4 ^{abc}	3.1	3.9	6.9 ^b	8.7 ^{ac}
T ₃	18.4	30.4	39.3 ^d	48.5 ^{bc}	3.2	3.6	6.4 ^b	8.3 ^{bc}
T ₄	19.9	34.7	50.8 ^a	58.2 ^a	3.3	3.9	7.9 ^a	9.8 ^a
T ₅	16.8	31.8	44.5 ^{bc}	51.3 ^{bc}	3.0	3.7	7.2 ^{ab}	9.2 ^{ab}
T ₆	17.0	28.4	39.7 ^{cd}	50.5 ^{bc}	3.0	3.6	6.5 ^{bc}	8.2 ^{bc}
T ₇	20.4	30.5	45.8 ^{ab}	54.4 ^{ab}	3.3	3.7	7.0 ^b	8.2 ^{bc}
GM	18.4	30.6	43.2	51.8	3.2	3.7	6.9	8.6
CD (P=0.05)	NS	NS	5.9	5.9	NS	NS	0.8	1.1
CV (%)	16.2	10.5	7.9	6.5	10.0	7.1	6.5	7.5

Table 2. Effect of organic and inorganic nutrient on leaf length and leaf diameter.

Treatment	Leaf length (cm)				Leaf diameter (mm)			
	30 DAT	60 DAT	90 DAT	120 DAT	30 DAT	60 DAT	90 DAT	120 DAT
T ₁	13.5	21.4	34.2 ^c	42.8	2.6 ^c	4.9 ^b	7.3 ^{bc}	10.0
T ₂	16.6	29.0	40.7 ^{bc}	46.5	3.0 ^{bc}	4.8 ^b	7.3 ^{bc}	11.0
T ₃	15.3	26.3	34.9 ^{de}	43.3	2.5 ^c	5.1 ^b	6.9 ^c	10.2
T ₄	16.8	30.5	48.4 ^a	50.9	3.8 ^a	6.5 ^a	8.6 ^a	11.7
T ₅	13.8	27.0	43.0 ^{ab}	44.9	3.4 ^{ab}	5.6 ^{ab}	7.9 ^b	10.7
T ₆	13.8	24.2	36.1 ^{cde}	45.1	3.1 ^{abc}	5.0 ^b	7.0 ^c	9.8
T ₇	16.8	26.6	39.9 ^{bcd}	47.7	2.7 ^{bc}	4.8 ^b	7.1 ^c	10.3
GM	15.2	26.4	39.6	45.9	3.0	5.2	7.4	10.5
CD (P=0.05)	NS	NS	5.4	NS	0.7	1.1	0.6	NS
CV (%)	12.0	12.6	7.9	6.3	12.6	11.9	4.6	7.0

Table 3. Effect of organic and inorganic nutrient on length and diameter of neck.

Treatment	Neck length (cm)				Neck diameter (mm)			
	30 DAT	60 DAT	90 DAT	120 DAT	30 DAT	60 DAT	90 DAT	120 DAT
T ₁	2.0	3.0	4.1	5.1	3.3	6.1 ^c	9.2 ^{bc}	11.7 ^b
T ₂	2.1	3.1	4.5	5.3	3.3	6.1 ^c	9.3 ^{bc}	11.5 ^b
T ₃	2.1	3.5	4.1	5.2	3.5	6.5 ^{abc}	9.4 ^{bc}	11.4 ^b
T ₄	2.1	3.2	4.1	5.4	4.0	7.0 ^a	12.1 ^a	13.9 ^a
T ₅	2.0	3.3	4.4	5.3	3.2	7.0 ^a	10.5 ^b	12.5 ^b
T ₆	2.0	3.1	3.9	5.0	3.4	6.8 ^{ab}	8.6 ^c	11.2 ^b
T ₇	2.0	3.3	3.9	5.4	3.5	6.5 ^{ac}	9.5 ^{bc}	11.4 ^b
GM	2.1	3.2	4.1	5.2	3.5	6.6	9.8	11.9
CD (P=0.05)	NS	NS	NS	NS	NS	0.6	1.5	1.3
CV (%)	6.7	8.2	6.8	5.0	10.7	5.4	9.0	6.3

was applied in three splits (as per treatment). Half the dose of N was given as basal and rest N was top dressed in two equal split doses at 25 and 50 days after transplanting. Mustard oil cake (1 t/ha) was applied only in two treatments (T₆ and T₇) as basal. Lime @ 1 t/ha was also applied in entire field at the time of field preparation for the soil reclamation one month before transplanting. Harvesting of bulbs was done on 5th December 2015 (*i.e.* 120 days after transplanting). The

data on various growth attributes (plant height, number of leaves /plant, leaf length, leaf diameter, neck length and neck diameter) were recorded during the period of investigation from ten randomly selected plants in each treatment and replication on 30, 60, 90 and 120 days after transplanting (DAT) and analyzed statistically. The total variation for different treatments was tested for significance by "F" test using analysis of variance technique.

The data on various growth attributes (Table 1 to 3) revealed that the mean sum of squares due to treatments were highly significant for plant height (90 DAT), number of leaves (90 DAT), leaf length (90 DAT) and neck diameter (90 DAT); significant for plant height (120 DAT); number of leaves (120 DAT); leaf diameter (30, 60 DAT) and neck diameter (120 DAT) and non-significant for plant height (30, 60 DAT), leaf length (30, 60, 120 DAT), leaf diameter (120 DAT), neck length (30, 60, 90, 120 DAT) and neck diameter (30 DAT). Overall, it indicated that onion cv. Agrifound Dark Red responded to different treatments of organic and inorganic combinations.

Among the treatments under trial, T₄ (20 t/ha FYM + (state recommended) NPK (125-100- 100 kg/ha) produced maximum plant height throughout the growing period. At 90 and 120 DAT, T₄ followed by T₇ and T₂ produced maximum plant height. Sankar *et al.* (4), Nandal and Bedi (3) and Yogita and Ram (5) reported significant effect of organic and inorganic nutrients on plant height of onion.

Among the various treatments the maximum number of leaves/plant was noted in T₄ and T₅ at 90 DAT and T₂, T₄ and T₅ at 120 DAT respectively. On the other hand, minimum number of leaves per plant were registered in T₁ and T₆ at 90 DAT and T₁, T₂, T₃, T₆ and T₇ at 120 DAT. Sankar *et al.* (4) recorded maximum leaf number by addition of organic manures and application of organic growth stimulants. Nandal and Bedi (3) and Yogita and Ram (5) had also recorded maximum leaf number with vermicompost and recommended dose of fertilizers. Jawadagi *et al.* (1) had also reported similar trends for growth parameters.

The different doses of organic and inorganic fertilizer exhibited a significant variation on leaf length at 90 DAT only. Maximum foliage lengths were noticed in T₄ and T₅. On the other hand, the minimum leaf length was observed in T₁, T₃ and T₆. Similar results were also reported by Jawadagi *et al.* (1) on leaf length of onion. The maximum leaf diameter was noted at T₄, T₅ and T₆ at 30 DAT; T₄ and T₅ at 60 DAT and T₄ at 90 DAT. Leaf diameters was non-significant at 120 DAS.

In neck length, the effect of different doses of organic and inorganic fertilizers was non- significant for all the observations at 30, 60, 90 and 120 DAT. Neck diameter revealed a significant difference due to

different doses of organic and inorganic fertilizers. Treatments like T₃, T₄, T₅, T₆ and T₇ at 60 DAT and T₄ at 90 and 120 DAT registered maximum neck diameter. Mahanthesh *et al.* (2) and Yogita and Ram (5) reported that integration of organic and inorganic nutrients improve the neck diameter of onion.

The overall performance of *kharif* onion under Red and Laterite Zone of West Bengal was highly satisfactory. Different combinations of organic and inorganic nutrients had significant influence on different growth attributes, as revealed from different responses received for different treatments. Treatment combination, 20 t/ha FYM + State recommended NPK (125-100-100 kg/ha) was excel others in all the growth parameters, except for neck length. The second best treatment noted was T₅ *i.e.* 20 t/ha FYM + STF *i.e.* 156-100-75 kg/ha. Thus, it may be concluded that state recommended or soil test based fertilizer along with higher doses of organics was beneficial for growth performance of onion.

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