International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2019; 7(4): 299-303

Received: 07-05-2019
Accepted: 09-06-2019

TM Nishchitha
Department of Horticulture, College of Agriculture, Central Agricultural University, Imphal, Manipur, India

AKB Devi
Department of Horticulture, College of Agriculture, Central Agricultural University, Imphal, Manipur, India

K James Singh
Department of Horticulture, College of Agriculture, Central Agricultural University, Imphal, Manipur, India

AH Singh
Department of Soil science, College of Agriculture, Central Agricultural University, Imphal, Manipur, India

NG Singh
Department of Basic sciences, College of Agriculture, Central Agricultural University, Imphal, Manipur, India

Correspondence
TM Nishchitha
Department of Horticulture, College of Agriculture, Central Agricultural University, Imphal, Manipur, India

Effect of organic source of nitrogen on growth and quality of local onion (*Allium cepa* var. *aggregatum* Don.)

TM Nishchitha, AKB Devi, K James Singh, AH Singh and NG Singh

Abstract
The present research was conducted to study the "Effect of Organic Source of Nitrogen on Growth and Yield of Local Onion (*Allium cepa* L. *var. aggregatum* Don.)" in *rabi* season 2018-19 in the research field of Department of Horticulture, COA, CAU, Imphal from October, 2018 to February, 2019. The experiment was layout in Randomized Block Design (RBD) constituting 7 treatments replicated three times. The treatment combinations were as follows; T_1 : 100% RDN by FYM, T_2 : 100% RDN by Poultry manure, T_3 : 100% RDN by Vermicompost, T_4 : 100% RDN by Pig manure, T_5 : 100% RDN by Mustard cake, T_6 : RDF (100 :50 :50 Kg NPK/ha), T_7 : Control (0). During the experiment observations related to growth, quality parameters were recorded. From the present investigation, it was observed that growth parameters such as Plant height (cm), Leaf length (cm), Number of leaves, Leaf area (cm^2), canopy (cm^2) was observed highest in T_6 and lowest was recorded in the treatment T_7: Control (0). Quality parameters such as TSS was highest in case of treatment T_6 (11.95 ^{0}Brix) and Dry matter was recorded highest in T_6 (9.22%) which is on par with the T_1 (9.18%) at harvest.

Keywords: Nitrogen, multiplier onion, organic source

Introduction
Multiplier onion (*Allium cepa* L. var. *aggregatum* Don.) is the oldest known crop belonging to the family *Alliaceae* of the genus *Allium* it is a bulbous biennial herb which grows closely packed clusters of bulb underground due to rapid division and formation of laterals. It is commonly propagated by small bulbs. In India onion is grown during *rabi* season. It can be grown on a wide range of soil such as sandy loam, silt loam and heavy clay soil. The p^H should be around 5.8-8.0. The problem of high cost of chemical fertilizers which supplies only few major nutrients lead to thinking of using different sources of nutrients such as farm yard manure, vermicompost, pig manure, poultry manure, mustard cake. In view of increased awareness about organic farming, residue free food production, increased availability of organic inputs and sustainability in the farm, investigation on these aspects have thus become imperative to study and assess their effect on growth, quality of growing onions organically in specific. Reddy and Reddy (2005) [7] studied the effect of different levels of vermicompost (0, 10, 20 and 30 t/ha) and nitrogen fertilizer (0, 50, 100, 150 and 200 kg/ha) on the growth and yield of onion (cv. N-53). Plant height, number of leaves per plant, leaf area, bulb length, diameter, weight and yield of onion increased significantly with increasing levels of vermicompost (from 10-30 t/ha) and nitrogen fertilizer (from 50-200 kg/ha). Baset Mia *et al*. (2007) [2] conducted an experiment, in that tallest plant was found in the treatment (T_3: N50% + 10 t ha^{-1} PM), followed by (T_2 : N75% + 5 t ha^{-1} PM) whereas the control treatment produced the shortest plant. Rahim *et al.* (2011) [6] conducted an experiment in garlic. He concluded that the tallest plant (75.53cm), maximum number of leaves (7.73), highest breadth and length of the longest leaves (1.45 cm) were recorded from the treatment combination of mustard oil cake. Bagali *et al*. (2012) [1] concluded that higher level of inorganics i.e., M3 (162:32:148 kg NPK ha-1) and higher levels of organics viz., S4 (VC 6 t ha-1) and S6 (PM 3 t ha-1) and S2 (FYM 30 t ha-1) recorded higher bulb yield of onion individually. This was reflected in growth parameters like plant height, number of leaves, leaf area, leaf area index and neck girth as well as yield parameters ED, PD and bulb weight. Sharief *et al.* (2013) [8] said that the highest averages of plant height, number of leaves/plant and foliage fresh weight per plant at 90 and 120 days from transplanting as well as TSS and dry matter percentage in

bulbs at harvesting and every month after harvesting till end of storability were produced from Giza Red cultivar in both seasons. Analysed data of Mohanty *et al.* (2015) [5] revealed that the maximum plant height (38.20 cm) was recorded in (T_3 *i.e.* 50% FYM and 50% NPK) whereas minimum value was noted in control plots (23.20 cm). Application of vermicompost resulted the height (35.60cm) which is at par with the highest height obtained in onion. Malshe *et al*. (2016) [4] opined that among the organic manures used in the experiment, neem cake showed the highest plant height (27.25 cm) followed by poultry manure. The number of leaves was higher (27.50 leaves) in neem cake and vermicompost treatments and at par in other treatments. The average plant spread of cabbage was also maximum (38.18 cm) in neem cake treatment.

Materials and methods

A experiment was carried out in the experimental field of Department of Horticulture, COA, CAU, Imphal (Altitude-850MSL, Latitude- 24^0 45'' N) on clayey soils during 2018-19. The soil of the experiments field was have a p^H-5.28, organic carbon-1.54 (%), available N-283.79 kg/ha, available P- 17.72 kg/ha, available K- 244.24 kg/ha. The treatment combinations were as follows; T_1 : 100% Recommended Nitrogen by FYM, T_2 : 100% Recommended Nitrogen by Poultry manure, T_3 : 100% Recommended Nitrogen by Vermicompost, T_4 :100% Recommended Nitrogen by Pig manure, T_5 : 100% Recommended Nitrogen by Mustard cake, T_6 : RDF (100 :50 :50 Kg NPK/ha), T_7 : Control (0).

The bulbs of the local cultivar *Meitei Tilhou* was used for planting in a plot size of $2m^2$ with a spacing of 10cm*10cm, the total number of plants in a plot was 200. The treatments are replicated three times in the experimental design randomized block design (RBD).

The organic manures used for the experiment was applied as a basal dose at the time of planting. The inorganic fertilizer(urea) was applied in split doses, one at the time of planting and another as top dressing at 30 days after planting. All other cultural practices were kept normal and uniform for all the plots. Data on different growth and quality parameters was recorded by using standard procedures. The plant morphological parameters like plant height, leaf length, number of leaves, leaf area were recorded by randomly selecting ten plants from each plot. The plant height was taken with the help of scale from ground to the highest leaf tip. Leaf length is measured as an avearage of 5 leaves from each hill. Number of leaves per hill were counted based on the visual examen. Total leaf area of onion is calculated by multiplying the number of leaves with the leaf length taken during the obaservation. Quality parameters such as TSS was recorded using the digital hand refractometer, the dry matter (%) against each treatment was recorded by keeping the bulb of onion in Hot air oven at 60 ^{0}C for 48 hours.

Results and discussion

Nitrogen (N) is subjected to loss and it has to be made available adequately when crop needs it. Due to escalating cost of fertilizers the alternative sources of N needs to be determined to supply it as per the demand of the crop. There are different locally available organic sources of N such as farmyard manure (FYM), vermicompost, pig manure, poultry manure, and mustard cake. Application of such organic manures also helps in maintaining soil fertility in addition to reducing the fertilizer cost. Hence, the need to find out an appropriate source and quantity of an organic source of N to obtain higher yield of onion was felt.

Growth parameters

Results revealed in Table 1. nitrogen had showed that a significant role in influencing growth parameters. At 15, 30, 45 and 60 days after planting, the maximum height of plant was recorded in treatment T_6-100% N through RDF(inorganic) *i.e* 44.70 cm. Lowest was at treatment T_7 (30.73 cm). Diagrammatically in Fig.1. At 15DAP the plant height was recorded non significant. But at 30, 45, 60 DAP the plant height was linearly increasing.

Table 1: Effect of different organic sources of nitrogen on plant height (cm) of onion at 15, 30, 45 and 60 DAP

Treatment	15 DAP	30DAP	45DAP	60DAP
T_1	16.26	29.17	33.66	36.34
T_2	16.58	29.79	36.13	37.58
T_3	16.60	29.88	34.99	37.21
T_4	16.26	29.44	33.63	37.03
T_5	16.83	30.32	37.05	39.15
T_6	17.20	32.10	40.54	44.70
T_7	15.51	26.03	29.66	30.73
S.Em (±)	0.79	0.83	1.27	1.55
C.D (0.05)	NS	2.56	3.93	4.80

T_1 : 100% Recommended Nitrogen by FYM, T_2 : 100% Recommended Nitrogen by Poultry manure, T_3 : 100% Recommended Nitrogen by Vermicompost, T_4 :100% Recommended Nitrogen by Pig manure, T_5 : 100% Recommended Nitrogen by Mustard cake, T_6 : RDF (100 :50 :50 Kg NPK/ha), T_7 : Control (0).

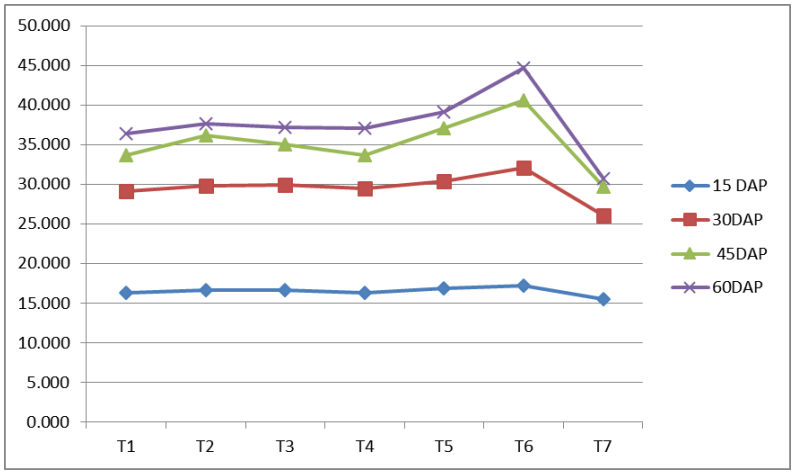

Fig 1: Diagrammatic representation of plant height (cm) at 15, 30, 45 and 60 DAP

Assessment of the data (Table 2) revealed that the leaf length was significant in every observation due to the application of different treatments. The longest leaf length was exhibited by T_6 (42.0 cm). The shortest leaf length (31.0 cm) was recorded with the treatment T_7 (control) at 60 days after planting. In all the stages i.e., 15, 30, 45 and 60 days after planting, the longest leaf length was observed in T_6 and shortest was observed in control plot. Results were contradictory to those of Sundharaiya *et al.* (2016)[9] who reported significant longer leaf length in FYM @ 12.5t/ha+ sea weed extract @ 2%. The contradictory results might be due to variation in soil fertility status, climatic conditions or species difference.

Table 2: Effect of organic source of nitrogen on Leaf length (cm) of onion at 15, 30, 45 and 60 DAP

Treatment	15DAP	30DAP	45DAP	60DAP
T_1	14.62	27.79	31.21	34.33
T_2	14.57	28.57	33.70	36.29
T_3	15.40	27.81	33.37	35.31
T_4	14.18	27.77	31.25	34.67
T_5	15.28	28.75	33.48	36.00
T_6	15.63	29.95	38.25	41.97
T_7	13.87	26.19	29.50	31.00
S.Em (±)	0.81	0.66	1.13	1.64
C.D (0.05)	NS	2.04	3.47	5.06

T_1 : 100% Recommended Nitrogen by FYM, T_2 : 100% Recommended Nitrogen by Poultry manure, T_3 : 100% Recommended Nitrogen by Vermicompost, T_4 :100% Recommended Nitrogen by Pig manure, T_5 : 100% Recommended Nitrogen by Mustard cake, T_6 : RDF (100 :50 :50 Kg NPK/ha), T_7 : Control (0).

The plant height and leaf length responded positively to the different sources of organic manures (Table 1 & 2). The tallest plants were obtained in the T_6 in which the nitrogen is supplemented through the inorganic fertilizers. The release of nutrients is easier in case of inorganic fertilizers which resulted in the maximum height of plant and longest leaf length of multiplier onion during the experiment. Similar results were found by Bagali *et al.* (2012) [1] in onion.

From the observed data (Table 3) it was found that at every stage all the treatments had significant effect on leaf number per hill and the leaf production per hill was increased with the advancement of days up to 45 days after planting and descended at 60 DAP. The maximum number of leaves per hill was received by T_6 (50.33) at 45 days after planting in the experiment, which is at par with T_3 & T_4. On the other hand, the lowest number of leaves per hill was received by the treatment T_7 (33.00). At 15 DAP there was no significant difference between the treatments observed. Diagrammatically represented in Fig.2. The results were contradictory to those of Malshe *et al.* (2016) [4] who got significantly more number of leaves in neem cake followed by poultry manure in cabbage.

Table 3: Effect of organic source of nitrogen on number of leaves of onion at 15, 30, 45 and 60 DAP

Treatment	15DAP	30DAP	45DAP	60DAP
T_1	21.47	36.17	41.17	37.43
T_2	19.00	32.40	40.13	39.37
T_3	19.47	34.67	43.40	39.97
T_4	19.13	31.60	38.33	37.07
T_5	21.47	35.47	42.60	39.03
T_6	22.27	37.57	50.33	45.77
T_7	17.53	28.20	33.00	32.07
S.Em (±)	1.40	1.83	2.80	1.76
C.D (0.05)	NS	5.63	8.64	5.42

T_1 : 100% Recommended Nitrogen by FYM, T_2 : 100% Recommended Nitrogen by Poultry manure, T_3 : 100% Recommended Nitrogen by Vermicompost, T_4 :100% Recommended Nitrogen by Pig manure, T_5 : 100% Recommended Nitrogen by Mustard cake, T_6 : RDF (100 :50 :50 Kg NPK/ha), T_7 : Control (0).

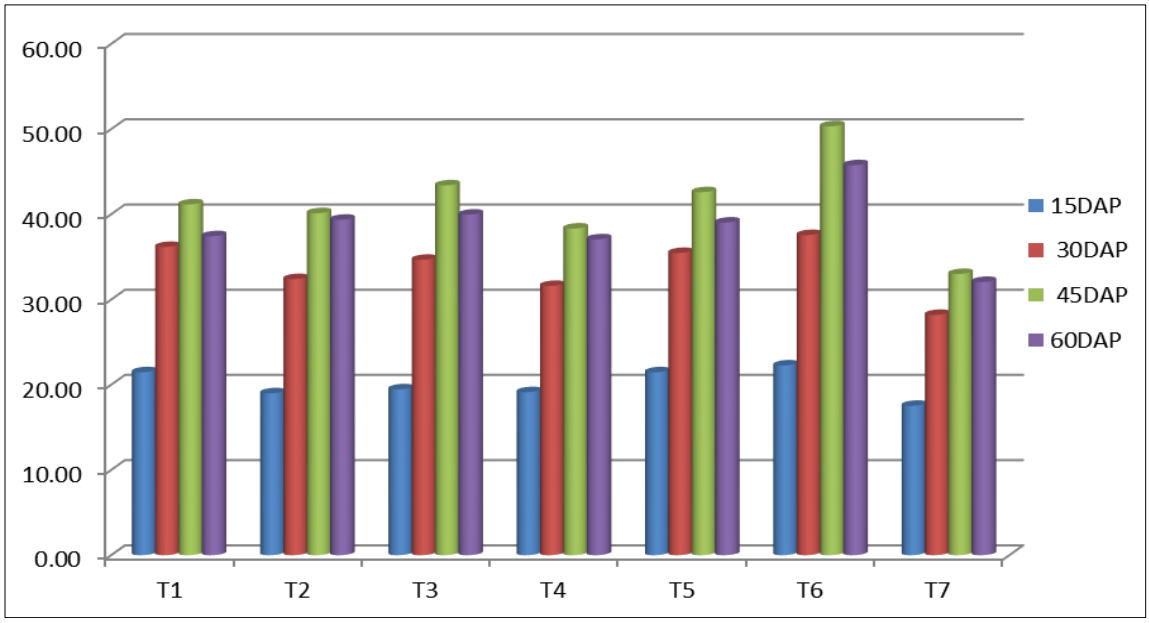

Fig 2: Diagrammatic representation of number of leaves at 15, 30, 45 and 60 DAP

Leaf area, which indicates the photosynthetic surface per unit area of leaf were significant in every observation. It was found to increase rapidly from 15 to 60 DAP. In respect of treatments, plants under T_6 and T_7 registered maximum and minimum leaf area respectively. Statistically significant variations was recorded in each observation. Same results were obtained by Reddy and Reddy (2005) [7].

Table 4: Effect of organic source of nitrogen on Total Leaf area (cm^2) at 15, 30, 45, and 60 DAP.

Treatment	15 DAP	30DAP	45DAP	60DAP
T_1	257.95	399.05	581.00	658.05
T_2	243.98	375.46	532.56	597.04
T_3	215.89	330.43	479.35	546.18
T_4	203.45	303.78	423.79	476.92
T_5	228.45	359.20	517.15	569.34
T_6	273.37	438.62	645.23	723.79
T_7	185.71	273.17	396.75	431.59
S.EM(±)	12.00	25.89	24.60	36.98
C.D(0.05)	36.98	79.78	75.82	113.95

T_1 : 100% Recommended Nitrogen by FYM, T_2 : 100% Recommended Nitrogen by Poultry manure, T_3 : 100% Recommended Nitrogen by Vermicompost, T_4 :100% Recommended Nitrogen by Pig manure, T_5 : 100% Recommended Nitrogen by Mustard cake, T_6 : RDF (100 :50 :50 Kg NPK/ha), T_7 : Control (0).

Total leaf area of onion was highest in T_6 (723.79 cm^2) and lowest was found in T_7 (control) i.e., 431.59 cm^2. T_6 was found highest during all the observation.

Table 5. showed TSS of the experiment. In the experiment, all the treatments significantly influence on TSS. The maximum value associated with T_6 with the value of 11.95 percent. The lowest value of TSS was recorded in T_7 (10.44). Source of nitrogen significantly influenced the values of TSS in the experiment. The effect of different treatments on leaf area of onion at 15, 30, 45 and 60 DAP were recorded and presented. Same results were obtained by Sharief *et al.* (2013) [8].

Table 5: Effect of organic source of nitrogen on TSS (%) At harvest.

Treatment	TSS (%)
T_1	11.06
T_2	11.40
T_3	11.50
T_4	10.79
T_5	10.81
T_6	11.95
T_7	10.44
S.Em(±)	0.09
C.D (0.05)	0.29

T_1 : 100% Recommended Nitrogen by FYM, T_2 : 100% Recommended Nitrogen by Poultry manure, T_3 : 100% Recommended Nitrogen by Vermicompost, T_4 :100% Recommended Nitrogen by Pig manure, T_5 : 100% Recommended Nitrogen by Mustard cake, T_6 : RDF (100 :50 :50 Kg NPK/ha), T_7 : Control (0).

Dry matter percent of bulb at 30, 45 and 60 DAP is represented in Table 6 and diagrammatically in the Fig.3.

Table 6: Effect of organic source of nitrogen on Dry matter at 30,45, 60 DAP.

Treatment	30 DAP	45DAP	60DAP
T_1	12.17	10.45	9.19
T_2	11.95	10.10	8.22
T_3	10.52	9.80	8.11
T_4	10.08	8.97	7.75
T_5	12.15	10.91	8.90
T_6	12.91	11.85	9.23
T_7	8.00	6.88	6.76
S.Em (±)	0.93	0.89	0.14
C.D (0.05)	2.87	2.75	0.42

T_1 : 100% Recommended Nitrogen by FYM, T_2 : 100% Recommended Nitrogen by Poultry manure, T_3 : 100% Recommended Nitrogen by Vermicompost, T_4 :100% Recommended Nitrogen by Pig manure, T_5 : 100% Recommended Nitrogen by Mustard cake, T_6 : RDF (100 :50 :50 Kg NPK/ha), T_7 : Control (0).

Evaluation of the data (Table 6.) revealed significant effect of different treatments on dry matter percent of bulb during the experiment. The dry matter accumulation in bulb decreased with increasing growth stages of the crop and reached maximum at 30 days after planting thereafter, it declined in all the treatments at 60 days after planting. Among all the treatment combinations, T_6 (9.23%) exhibited maximum and T_7 (6.76%) minimum in dry matter percent respectively. Significant difference between T_7 and T_6 was also recorded in all stages of observation. Contradictory results obtained to those of Geetha *et al.* (1999) [3]. Where the dry matter accumulation was obtained highest in FYM.

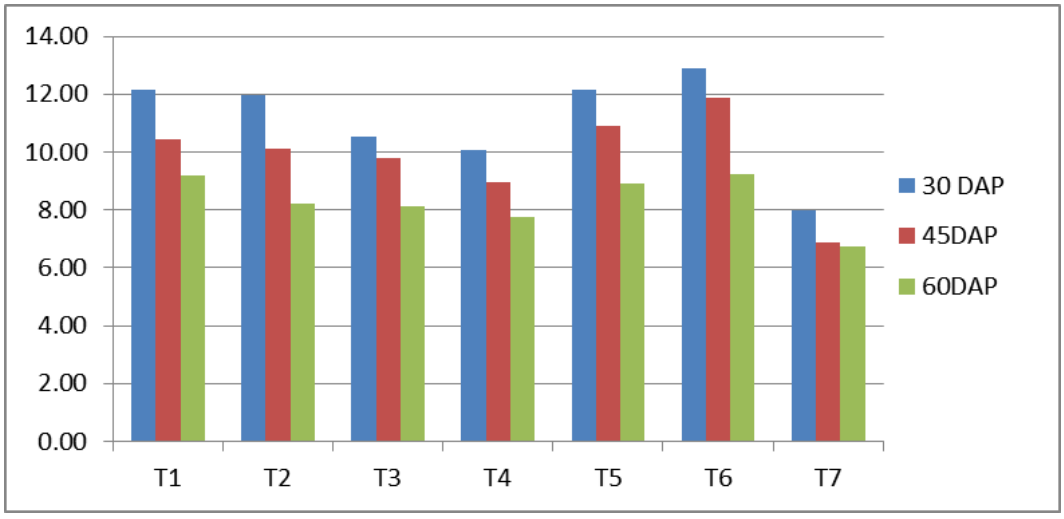

Fig 3: Diagrammatic representation of dry matter (%) at 30, 45 and 60 DAP.

Conclusion

From the present investigation, it was observed that growth parameters such as Plant height (cm), Leaf length, Number of leaves, Leaf area (cm^2) were highest in T_6: RDF (100 :50 :50 Kg NPK/ha) and lowest were recorded in the treatment T_7 : Control (0). Quality parameters such as TSS was highest in case of treatment T6 (11.953 ^{0}Brix) and Dry matter was recorded highest in T_6 (9.22%) which is on par with the T_1 (9.18%).

Acknowledgement

The authors are highly graceful for the whole team of the Department of Horticulture, College of Agriculture, CAU, Imphal for their whole hearted cooperation, encouragement and constructive criticism throughout the period of research activity**.**

References

1. Bagali AN, Patil HB, Chimmad VP, Patil PL, Patil V *et al*. Effect of inorganics and organics on growth and yield of onion *(Allium cepa* L.). Karnataka Journal of Agricultural Scienes. 2012; 25(1):112-115.
2. Baset Mia MA, Akteri S, Mollai AH, Rahman GKM *et al*. Poultry Manure with Inorganic Nitrogen on Growth and Yield of Onion (*Allium cepa* L.). The Agriculturists. 2005; 5(1-2):101-108.
3. Geetha K, Raju AS, Shanti M *et al*. Effect of farm yard manure and potassium on K nutrition and yield of onion at different stages of growth. Journal of Research. ANGRAU. 27(1-2):18-23.
4. Malshe KV, Desai BG *et al*. Response of cabbage to organic manures. Jounal of Eco-friendly Agriculture. 2016; 11(1):10-11.
5. Mohanty A, Behera P, Harichandan S *et al*. Effect of nutrient management on the growth and productivity of onion. Agriculture Science Digest. 2005; 35(3):241-243.
6. Rahim MA, Kabir MA, Majumder DAN *et al*. Effect of organic manure on the expansion and yield of garlic beneath zero tillage condition. Journal of Agroforestry and Environment. 2011; 5(1):139-142.
7. Reddy KC, Reddy KM *et al*. Differential levels of vermicompost and nitrogen on growth and yield in onion (*Allium cepa* L.) – radish (*Raphanus sativus* L.) cropping system. Jounal of Research ANGRAU. 33(1):11-17.
8. Sharief AE, Ahmed A, Kandil, Fathalla FH *et al*. Effect of transplanting dates of some onion cultivars on vegetative growth, bulb yield and its quality. ESci Journal of Crop Production. 2013; 2(3):72-82
9. Sundharaiya K, Sujatha K, Renganayaki PR, Sathish G *et al*. Exploitation of organic inputs for growth and yield of Multiplier onion (*Allium cepa var. aggregatum*) var. CO (on 5). Journal of. Progressive Agriculture, 2016; 7(2):52-64.