



P-ISSN: 2349-8528

E-ISSN: 2321-4902

IJCS 2019; 7(5): 1415-1418

© 2019 IJCS

Received: 25-07-2019

Accepted: 27-08-2019

Deshmukh BD

Department of Horticulture,
Mahatma Phule Krishi
Vidyapeeth, Rahuri
Ahmednagar, Maharashtra,
India

Wankhade SD

Department of Horticulture,
Mahatma Phule Krishi
Vidyapeeth, Rahuri
Ahmednagar, Maharashtra,
India

Pawar PS

Department of Horticulture,
Mahatma Phule Krishi
Vidyapeeth, Rahuri
Ahmednagar, Maharashtra,
India

Correspondence**Wankhade SD**

Department of Horticulture,
Mahatma Phule Krishi
Vidyapeeth, Rahuri
Ahmednagar, Maharashtra,
India

Effect of foliar application of fertilizer grades on growth and yield of onion (*Allium cepa* L.) cv. N-2-4-1

Deshmukh BD, Wankhade SD and Pawar PS

Abstract

A field experiment was carried out to assess the Effect of foliar application of fertilizer grades on growth and yield of onion (*Allium cepa* L.) cv. N-2-4-1 at Vegetable Improvement Project, Department of Horticulture, Mahatma Phule Krishi Vidyapeeth, Rahuri during rabi season of 2011-12. The experiment was laid out in FRBD with 3 replication along with 12 treatment combinations comprising of 4 graded fertilizers viz., 20:20:20, 00:52:34, 13:00:45 and 12:61:00 with 3 concentration viz., 5 g/lit, 7.5 g/lit and 10 g/lit along with control. The result of the present investigation revealed that growth parameter were most effectively influenced by the treatment 20:20:20 in 5 g/lit with 3 sprays viz., mean plant height and average number of leaves at harvest over the control. Foliar application significantly maximized bulb parameters like average bulb weight, Polar diameter and equatorial diameter of bulb over the soil application of recommended dose of fertilizer.

Keywords: Fertilizers, foliar spray, NPK, onion, yield

Introduction

In Maharashtra almost all farmers are cultivating the onion crop with fertilizers applied through soil and foliar application in three distinct season; kharif (pol), late kharif (rangada) and rabi seasons. Fertilizers used to increase the production can't bring a full profit to the farmer unless they are applied in most efficient and economical way. This will mean that the method adopted have to be less expensive and easy to practice. Plant nutrients can be applied through foliar sprays as well as soil application. All the essential elements can be taken by the plants through foliage, but in small quantities at a time. Plants can absorb and utilize the nutrients much more efficiently when they are applied through soil (Tolanur, 2006) [15]. Foliar application is not a substitute for soil application but it is an effective additional means of supplying sudden increased demand of nutrients. Due to various soil factors, soil application of NPK fertilizers will cause fixation, irrigation loss due to leaching and nutrients will go beyond reach of the plant. In case of foliar application nutrients are supplied directly to where they are required. It indicates that foliar application of fertilizer grades is a feasible alternative to increase yield with specific nutrient deficiencies (Trejo-Tellar *et al.*, 2003) [16]. The present study probably is the first of its kind, to investigate "Effect of foliar application of fertilizer grades on growth and yield of onion (*Allium cepa* L.) cv. N-2-4-1".

Materials and methods

The experiment was carried out at all India Co-ordinated Research Project on Vegetable crops, Department of Horticulture, Mahatma Phule Krishi Vidyapeeth, Rahuri, Dist. Ahmednagar, during the rabi season of 2011-12. The experiment was laid out in Factorial Randomized Block Design (FRBD) with three replications having thirteen treatments including one control. All the treatments have been received the recommended dose of fertilizers i.e. 20 tons FYM and 100:50:50 NPK kg ha⁻¹ during experiment Seed was sown in raised beds on 30th October, 2011. Main field was prepared to fine tilth and flat beds of 3 x 2 m² were made. Before transplanting, experimental site was applied with well decomposed farm yard manure and was well mixed with soil @ 20 t ha⁻¹. Basal dose of NPK @ 50:50:50 kg ha⁻¹ was given before the transplanting of the seedlings. Remaining 50 kg ha⁻¹ dose of nitrogen was applied one month after transplanting as top dressing. The different foliar fertilizer grades in cheated forms of NPK 20:20:20, 00:52:34, 13:00:45 and 12:61:00 were sprayed at 30, 45 and 60 DAP (Days

after planting) for 3 sprays. All the foliar sprays of fertilizer grades were given at concentrations of 5 g/lit, 7.5 g/lit and 10 g/lit of water.

Eight weeks old healthy and uniform seedlings having about 15-20 cm height were used for transplanting. Transplanting was done on 1st January, 2012 with 15 x 10 cm spacing. The data collected on various observations on growth parameter

like Average plant height, Average number of leaves similarly yield and quality attribute like Equatorial diameter of bulb, polar diameter of bulb, average weight of bulb, total bulb yield and marketable bulb yield during the course of investigation were statistically analyzed and result was interpreted by using methods suggested by Panse and Sukhatme (1967) [10].

Treatment details

Factor A 'A' Factor (Fertilizer grades) – (4)		Factor B (Concentrations) – 5, 7.5, 10 g/litre of water – (3)	
A1	20:20:20	B1	5 g/litre of water
A2	00:52:34	B2	7.5 g/litre of water
A3	13:00:45	B3	10 g/litre of water
A4	12:61:00		

Sr. No.	Treatment symbol	Treatment details Fertilizer grades and their concentrations	Number of sprays
1.	T ₁	20:20:20/5 g/lit.	3
2.	T ₂	20:20:20/7.5 g/lit.	3
3.	T ₃	20:20:20/10 g/lit.	3
4.	T ₄	00:52:34/5 g/lit	3
5.	T ₅	00:52:34/7.5 g/lit	3
6.	T ₆	00:52:34/10 g/lit	3
7.	T ₇	13:00:45/5 g/lit	3
8.	T ₈	13:00:45/7.5 g/lit	3
9.	T ₉	13:00:45/10 g/lit	3
10.	T ₁₀	12:61:00/5 g/lit	3
11.	T ₁₁	12:61:00/7.5 g/lit	3
12.	T ₁₂	12:61:00/10 g/lit	3
13.	T ₁₃	Control	No spray

N.B.-1st spray at 30 DAP, 2nd spray at 45 DAP and 3rd spray at 60 DAP

Results and Discussion:

Plant Height

The data presented in Table 1 revealed that that the applications of different fertilizer grades and concentrations were significantly influenced the plant height. At harvest, the fertilizer grade (20:20:20) showed the maximum mean height of plant (83.75 cm) and concentration of fertilizer grade (5 g/lit) showed maximum mean plant height (84.04 cm). The combination of fertilizer grade (20:20:20) with concentration (5 g/lit) showed the maximum mean plant height (85.35 cm) over other combinations.

Maximum plant height in the foliar application of three sprays of fertilizer grades 20:20:20 may be due to 100 per cent solubility, high nitrate nitrogen (NO₃-N), NH₄-N and amide-N, which may have led to profuse vegetative growth of tissues. The results obtained are in close agreement with the observations recorded by Bhonde *et al.* (1995) and Gupta *et al.* (2008) [5].

Average Number of leaves

The average numbers of leaves were found to be significantly influenced by the application of different fertilizer grades and concentrations (table.1). The Maximum average number of leaves (11.28) at harvest was reported in fertilizer grade (20:20:20) and the concentration 5 g/lit reported maximum average number of leaves (11.38). Under the interaction effect

of fertilizer grade (20:20:20) with 5 g/lit concentration reported maximum average number of leaves (11.97) as compared to control (10.80).

Foliar fertilizer applied were penetrates in plants through stomata. They increases the internal balanced nutrient content of plant which results in more storage assimilations, more photosynthetic activity of the onion plants which results in increased numbers of leaves (Brewster and Rabinowitch, 1990) [4]. These results of present investigation were very close agreement with those of Singh *et al.* (2000) [13], Tiwari *et al.* (2002) [14] and Joshi (2005) [8].

Average weight of bulb

The data presented in table 1 revealed that, Maximum average weight of bulb (71.00 g) showed by fertilizer grade 20:20:20 and average weight of bulb (70.64 g) showed maximum by concentration 5 g/lit. The fertilizer grade 20:20:20 with concentration 10 g/lit showed maximum average weight of bulb (71.75 g). The control treatment showed average weight of bulb (60.10 g) which was less as compare to above treatment. The treatment T₁ (20:20:20, NPK 3 sprays) have maximum number of leaves and highest plant height; it leads to increased average bulb weight of onion in this treatment. These findings are also in close agreement with those reported by Bhonde *et al.* (1995), Palaniappan *et al.* (1999) [11] and Shrinath (2004) [12].

Table 1: Effect of different treatments of fertilizer grades and their concentration on mean plant height (cm) at harvest, number of leaves per plant and average weight of bulb

Treatments	Plant height at harvest (cm)	Number of leaves per plant	Average weight of bulb (g)
A1	83.75	11.28	71.00
A2	83.11	11.13	64.45
A3	82.07	11.13	69.72
A4	80.26	11.02	67.66
S.E. ±	0.38	0.05	0.68
C.D. (5%)	1.12	0.14	1.99
B1	84.04	11.38	70.64
B2	81.87	10.92	69.57
B3	80.97	11.13	64.42
S.E. ±	0.33	0.04	0.58
C.D. (5%)	0.98	0.12	1.72
A1B1	85.35	11.97	71.67
A1B2	83.82	11.13	69.58
A1B3	82.07	10.73	71.75
A2B1	84.95	10.93	70.98
A2B2	82.55	11.20	69.67
A2B3	81.82	11.27	52.71
A3B1	84.92	11.33	70.09
A3B2	80.97	10.80	70.94
A3B3	80.32	11.27	68.12
A4B1	80.95	11.27	67.81
A4B2	80.15	10.53	68.09
A4B3	79.68	11.27	67.09
Control	79.48	10.80	60.10
S.E. ±	0.66	0.08	1.17
C.D. (5%)	NS	0.25	3.44

Polar and equatorial diameter of bulb

The data presented in table no.2 shows that the maximum polar diameter (4.98 cm) was recorded in fertilizer grade 20:20:20 and in concentration (7.5 g/lit) the maximum polar diameter (4.89 cm) was recorded. Under the interaction of 12:61:00 fertilizer grades with concentration 7.5 g/lit recorded maximum polar diameter (5.32 cm). Birajdar (1991) [3] reported similar results and concluded that integrated nutrient management in onion enhances the polar and equatorial diameter. These results are similar with the results of present investigation.

Similarly Mean equatorial diameter of bulb (4.99 cm) was found maximum in fertilizer grade 20:20:20 and mean equatorial diameter of bulb (5.03 cm) were found maximum at 5 g/lit. Under interaction of 13:00:45 fertilizer grade with concentration 10 g/lit found maximum mean of equatorial diameter of bulb (5.69 cm). The comparatively significant increase in height, number of green leaves due to combined effects in those treatments might have helped to accumulate more carbohydrate resulting in increased diameter because the bulb is the storage organ of the onions and whatever carbohydrates produced in the leaves were stored in the bulbs resulting in bigger sized bulbs as indicated by the diameter. These results are in close agreement with those of, Birajdar (1991) [3] Jayathilake *et al.* (2002) [7] and Khandelwal (2010) [9].

Total bulb yield

From the data (Table.2) it is observed that the differences due to various fertilizer grades and concentration were significant

in respect of total bulb yield. The maximum total bulb yield (33.26 t/ha) was found in A1 followed by A2 (30.95 t/ha) and The maximum total bulb yield (30.90 t/ha) was found in B1 and minimum (23.56 t/ha) in control mean. Whereas treatment T1 (20:20:20 NPK in 5 g/lit, 3 sprays) recorded maximum total bulb yield (34.95 t/ha). The interaction effect due to various fertilizer grade and their concentrations was found to be statistically non-significant in respect of total bulb yield.

Foliar fertilizer application increases both vegetative growth parameters and yield contributing characters responses increased total bulb yield. These results are in close agreement with those of Baghel and Sarnaik (1988), Hawari *et al.* (1991), Bhonde *et al.* (1995 and Gupta *et al.* (2008) [5]

Table 2: Effect of different treatments of fertilizer grades and their concentration on polar diameter of bulb (cm), Equatorial diameter of bulb and yield per ha.

Treatments	Polar diameter of bulb (cm)	Equatorial diameter (cm)	Yield (T/Ha.)
A1	4.98	4.99	33.26
A2	4.55	4.96	30.95
A3	4.56	4.86	29.12
A4	4.76	4.66	25.17
S.E. ±	0.07	0.04	0.54
C.D. (5%)	0.20	0.14	1.60
B1	4.68	5.03	30.90
B2	4.89	4.96	29.25
B3	4.57	4.61	28.73
S.E. ±	0.06	0.04	0.47
C.D. (5%)	0.17	0.12	1.39
A1B1	4.88	5.13	34.95
A1B2	4.84	5.05	33.44
A1B3	5.21	4.80	31.41
A2B1	4.58	5.12	32.14
A2B2	4.97	4.99	30.87
A2B3	4.10	4.77	29.84
A3B1	4.57	4.96	31.40
A3B2	4.41	4.94	27.61
A3B3	4.69	5.69	28.36
A4B1	4.68	4.91	25.10
A4B2	5.32	4.86	25.09
A4B3	4.28	4.20	25.31
CONTROL	3.24	4.82	23.56
S.E. ±	0.12	0.08	0.94
C.D. (5%)	0.34	NS	NS

Conclusion

From the above findings it can be concluded that for obtaining maximum yield of onion, application of 20:20:20 NPK in 5 g/lit concentration in 3 sprays should be given to the onion crop. The foliar application of fertilizer grades helps in maintaining optimum soil nutrients which enhancing the yield of rabi onion crop.

References

1. Baghel BS, Sarnaik DA. Comparative study of soil and foliar application of zinc and boron on growth, yield and quality of onion, *Allium cepa* L. cv. Pusa Red. Research and Development Reporter. 1988; 5(1-2):76-79.
2. Bhonde SR, Ram L, Pande UB, Tiwari HN. Effect of micronutrients on growth, yield and quality of kharif onion, *Allium cepa* L. cv. Pusa Red. Research and development Reporter. 1988; 5(1-2):76-79.
3. Birajdar BG. Effect of inorganic, organic and biofertilizer and their combinations on growth, yield and storage of

- onion bulbs cv. N-2-4-1. M.Sc. (Agri.) Thesis submitted to Mahatma Phule Krishi Vidyapeeth, Rahuri (Maharashtra), 1991.
4. Brewster JL, Rabinowitch HD. Onion and Allied crops. CRC Press, Inc. Boca Raton, Florida. 1990; 1:32-37.
 5. Gupta RP, Bonde SR, Hariprakash. The effect of different levels of sulphur as soil and foliar applications. News Letters, NHRDF, Nasik. 2008; 28:3-5.
 6. Hawari NA, Mihi MM, Metwally IO, Masry MA, Kamel AS. Influence of intercropping patterns and foliar spray with micronutrients on growth and yield of faba bean and onion. Agril. Sci. 1991; 29(2):669-679.
 7. Jayathilake PKS, Reddy IP, Srihari D, Neeraja G, Ravinder Reddy. Effect of nutrient management on growth, yield and yield attributes of rabi onion (*Allium cepa* L.), Veg. Sci. 2002; 29(2):184-185.
 8. Joshi VR. Studies on integrated approach on improvement of marketable bulb yield and keeping quality of kharif onion (*Allium cepa* L.). A Ph.D. Thesis Submitted to Mahatma Phule Krishi Vidyapeeth, Rahuri, Dist-Ahmednagar, Maharashtra state, 2005.
 9. Khandelwal RB. Effect of integrated nutrient management on yield and quality of onion (*Allium cepa* L.) cv.N-2-4-1. Annual Report. ARS; Durgapura, Jaipur, 2010.
 10. Panse VG, Sukhatme PV. Statistical methods for agricultural workers. 4th Ed. ICAR, New Delhi. 1985, 157-165.
 11. Palaniappan SP, Jayabal A, Cheliah S. Response of tomato and chilli to foliar application of speciality fertilizers. Veg. Sci. 1999; 26(2):198-200.
 12. Shrinath BM. Studies on effect of foliar application of calcium and zinc on yield and keeping quality of onion bulbs (*Allium cepa* L.) cv. Phule Samarth A M.Sc. (Agri.) thesis submitted to MPKV, Rahuri, Dist. Ahmednagar, Maharashtra State, 2004.
 13. Singh A, Bose US, Tripathi SK, Rajoriya UK. Effect of plant growth regulators and starter solution on growth and yield of kharif onion. Crop Research. 2000; 22(2):232-235.
 14. Tiwari RS, Agarwal A, Sengar SC. Effect of doses and methods of nitrogen application on growth, bulb yield and quality of "Pusa Red" onion. Indian J Agric. Sci. 2002; 72(1):23.
 15. Tolanur S. Textbook of soil fertility fertilizers and integrated nutrient management. International Book Seller, 2006, 10.
 16. Trejo-Tellar LI, Rodriguez-Mendoza M, de-las N, Alcantar-Gonzalez G, Vazquez-Alarcon A. Specific foliar fertilization to correct nutrient deficiencies in three soil types. Terra, 2003, 21(3):365-372.