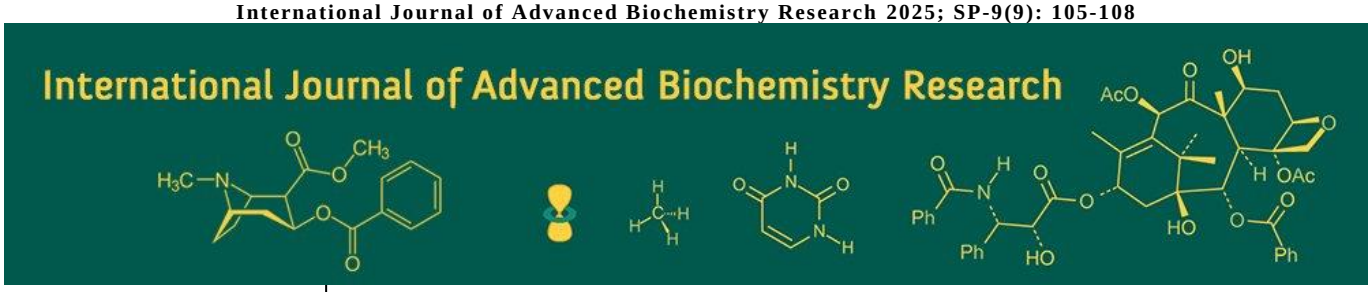

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Effect of integrated nutrients management on growth, yield and economics of onion

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Abstract
An experiment was conducted at Horticultural Research Farm, COH, AAU, Anand during the three consecutive years 2021-22, 2022-23 and 2023-24 on Onion cv. Gujarat Junagadh Red Onion 11. The experiment was laid out in RBD with three replications and twelve treatments *viz*., T_1: 100% RDF (75:60:50 NPK kg/ha), T_2: 10 t FYM + 100% RDF (75:60:50 NPK kg/ha), T_3: 100% RDF (75:60:50 NPK kg/ha) + 20 kg S, T_4: 100% RDF (75:60:50 kg/ha) + 40 kg S, T_5: 25% RDN through FYM + 75% RDF + 20 kg S, T_6: 25% RDN through FYM + 75% RDF + 40 kg S, T_7: 25% RDN through VC + 75% RDF + 20 kg S, T_8: 25% RDN through VC + 75% RDF + 40 kg S, T_9: 50% RDN through FYM + 50% RDF + 20 kg S, T_{10}: 50% RDN through FYM + 50% RDF + 40 kg S, T_{11}: 50% RDN through VC + 50% RDF + 20 kg S and T_{12}: 50% RDN through VC + 50% RDF + 40 kg S. The observations were recorded on different growth, yield and economics. The treatment T_{12} (50% RDN through VC + 50% RDF + 40 kg S) recorded significantly, maximum bulb weight (65.54 g), bulb equatorial diameters (6.13 cm) and bulb yield (42.83 t/ha) and net return (3, 27,825 ₹/ha) on pooled basis. Whereas, No. of leaves at 45 and 60 DAP and plant height at 45 and 90 DAP were found non-significant.

Keywords: INM, vermicompost, bulb weight and onion

Introduction
The bulbous vegetable crop, onion (*Allium cepa* L.) is grown all over the world. It is a grown under tropical, sub-tropical and temperate climatic condition. Onion cultivated during *kharif*, late *kharif* and *rabi* season. The maximum area under cultivation is covered in *rabi* season. Onion is known its flavour, pungency and medicinal value. Onion serves as a very excellent raw material for the food preparation industries and it can be manufactured into rings, shreds, powder, or onion in vinegar or brine. India produces about 26,830 MT of onion from an area of 1,639 Mha with productivity of 16.36 metric tonnes (Anonymous, 2021) [1, 2]. Gujarat has a productivity of 25.67 metric tonnes and produces around 2109 MT of onions from an area of 821 Mha (Anonymous, 2021) [1, 2].

As a nutrient-sensitive crop, onions have different nutrient needs depending on the cultivar, region, and time of year. The soil ecology is deteriorated, toxicity is increased, and leaching occurs when synthetic fertilisers are used alone. Vermicompost has proved to be an efficient technology for converting waste material into quality manure. It enhances the availability of macronutrient as well as micronutrient (Pandey *et al*. 2007) [7]. According to a study by Kwaghe *et al*. (2017) [5], the mixture of both organic and inorganic fertilisers increased the onion crop's nutrient uptake to 0.76, 43.82 and 2.42 NPK kg/ha, improving crop production. INM provide an adequate and balanced nutrient for attaining good crop yield and quality without affecting soil fertility status. Therefore, keeping in view the production of onion with judicial application of organic substances along with synthetic fertilizers is an integrated way to reduce health hazards, to protect environment as well as enhancing production of onion.

Materials and Methods
The field experiment was laid out during the three consecutive years 2021-22, 2022-23 and 2023-24 at Horticultural Research Farm, College of Horticulture, Anand Agricultural University, Anand, Gujarat, India, during the *rabi* season. The experiment was laid out with twelve treatments *i.e*., T_1: 100% RDF (75:60:50 NPK kg/ha), T_2: 10 t FYM + 100% RDF (75:60:50 NPK kg/ha), T_3: 100% RDF (75:60:50 NPK kg/ha) + 20 kg S, T_4: 100% RDF

(75:60:50 kg/ha) + 40 kg S, T_5: 25% RDN through FYM + 75% RDF + 20 kg S, T_6: 25% RDN through FYM + 75% RDF + 40 kg S, T_7: 25% RDN through VC + 75% RDF + 20 kg S, T_8: 25% RDN through VC + 75% RDF + 40 kg S, T_9: 50% RDN through FYM + 50% RDF + 20 kg S, T_{10}: 50% RDN through FYM + 50% RDF + 40 kg S, T_{11}: 50% RDN through VC + 50% RDF + 20 kg S and T_{12}: 50% RDN through VC + 50% RDF + 40 kg S in a Randomized Block Design with three replications with plot size of 2.55 × 1.70 m. The experimented plot soil was light alluvial having sandy loam texture with pH of 7.73, organic carbon 0.47%, available P_2O_5 47.22 kg/ha, available K 174 kg/ha. Onion seedling of variety Gujarat Junagadh Red Onion 11 was planted at spacing of 15 x 10 cm. Application of 50% Nitrogen, 100% P_2O_5 and K_2O was given as basal application while 50% Nitrogen was applied at 30 DATP. While all organic manures and bentonite (Sulphur) was applied with organic manures as a basal.

Five randomly chosen plants per plot were tagged in order to record different growth and yield parameter observations. Plant height was measured by measuring scale by measuring scale from ground level to tip of tallest leaf at 45 and 90 DATP. Vernier callipers were used to measure the bulb diameter at the centre section. A weighing balance was used to weigh five bulbs from randomly selected tagged plants, and the average value was then determined. While, onion yield was recorded in kg per plot separately and converted into t/ha. As recommended by Panse and Sukhatme (1989) [8], treatments were compared using critical difference, and statistical analysis of the data recorded in all observations was calculated using methods of analysis of variance.

Results and Discussion

Growth Parameters of Onion

Number of leaves at 45 and 60 DAP

The data revealed that the number of leaves at 45 and 60 DAP influenced by different integrated nutrient management treatment in pooled data are presented in Table 1. The data show non-significant effect.

Plant height at 45 DAP and 90 DAP (cm)

The data pertaining to plant height at 45 DAP and 90 DAP influenced by different integrated nutrient management treatment in pooled data are presented in Table 1. The data show non-significant effect.

Yield Parameters of Onion

Bulb weight (g)

The data revealed that the bulb weight was found significant in pooled analysis (Table 2). Maximum bulb weight (65.54 g) was recorded with the treatment T_{12} (50% RDN through VC + 50% RDF + 40 kg S) but, it was at par with treatment T_8 and T_{11}.

The higher bulb weight of crops with the use of vermicompost and an inorganic fertilizer might be ascribed to higher nutrient concentration and beneficial effect on physical environment of soil. Organic manures may have a positive impact on bulb weight because they provide an extra source of plant nutrients and enhance the physico-chemical and biological characteristics of the soil as a whole (Datt *et al*. 2003) [3]. It could also be attributed to the fact that after decomposition and mineralization, the applied manures supplied available nutrients directly to plant and also had solubilizing effect on fixed form of nutrients (Singh *et al*. 2001) [14]. The role of N and S in improving the vegetative growth and accelerating the photosynthesis in storage organs of bulbs, ultimately resulting in an increased bulb fresh weight. These results are in agreement with those of Mishu *et al*. 2013 [6] and Zaman *et al*. 2011 [16]. Similarly, Sharma *et al*. (2005) [12], Sharma *et al*. (2009) [10] found that the combined use of vermicompost and chemical fertiliser increased onion bulb weight.

Bulb equatorial diameter (cm)

The data revealed that the bulb equatorial diameter was found significant in pooled analysis (Table 2). Maximum Bulb equatorial diameter (6.13 cm) was recorded with the treatment T_{12} (50% RDN through VC + 50% RDF + 40 kg S) but it was at par with treatment T_8 and T_{11}.

With the use of organics and inorganics, the bulb equatorial diameter may have increased. This could be due to the organic manures increased porosity and decreased bulk density, which improved the physical condition of the soil for better onion plant bulb growth.

Bulb yield (q/ha)

The data pertaining to bulb yield was found significant in pooled analysis (Table 2). Maximum bulb yield (42.83 q/ha) was recorded with the treatment T_{12} (50% RDN through VC + 50% RDF + 40 kg S) but it was at par with treatment T_8 and T_{11}.

Better nutrient absorption may lead to faster synthesis and translocation of photosynthetie from source (leaves) to sink (bulb), increasing the bulb width and weight and ultimately increasing the total bulb yield. (Singh and others, 1997) [13]. Application of vermicompost improves soil microbial activities and adds secondary and micronutrients in addition to primary nutrients. Thus, a combination of chemical fertilizers and organic manures ensures that the onion crop receives a balanced supply of nutrients at every stage of growth. Larger onions and an overall higher yield could be the consequence of organic manure providing the crop with balanced nutrition and improving soil condition, which in turn led to better growth and development and a higher yield. Thangasamy *et al*. (2015) [15], Sharma *et al*. (2018) [11], and Rathod *et al*. (2022) [9] also support the aforementioned findings in onion.

Economics of onion

Data on economics given Table 3 revealed that higher bulb yield (42.83 t/ha) and net return (3, 27,825 ₹/ha) was observed with application of 50% RDN through VC + 50% RDF + 40 kg S. These results are in line with finding of Dilpreet *et al*. 2018 in onion.

Table 1: Effect of integrated nutrient management on growth parameters of onion (Pooled)

Treatment		Number of leaves at 45 DAP	Number of leaves at 60 DAP	Plant height at 45 DAP (cm)	Plant height at 90 DAP (cm)
T_1: 100% RDF (75:60:50 NPK kg/ha)		6.52	8.02	61.00	70.84
T_2: 10 t FYM + 100% RDF (75:60:50 NPK kg/ha)		6.62	8.13	61.56	71.89
T_3 : 100% RDF (75:60:50 NPK kg/ha) + 20 kg S		6.42	7.82	59.67	71.18
T_4 : 100% RDF (75:60:50 NPK kg/ha) + 40 kg S		6.31	7.67	58.76	68.87
T_5: 25% RDN through FYM + 75% RDF + 20 kg S		6.33	7.78	60.04	70.84
T_6: 25% RDN through FYM + 75% RDF + 40 kg S		6.64	8.13	60.31	69.38
T_7: 25% RDN through VC + 75% RDF + 20 kg S		6.51	7.98	59.53	70.96
T8: 25% RDN through VC + 75% RDF + 40 kg S		6.73	8.09	60.56	70.22
T_9: 50% RDN through FYM + 50% RDF + 20 kg S		6.49	7.64	59.29	68.64
T_{10}: 50% RDN through FYM + 50% RDF + 40 kg S		6.64	8.20	61.76	71.44
T_{11}: 50% RDN through VC + 50% RDF + 20 kg S		6.53	7.92	61.18	69.99
T_{12}: 50% RDN through VC + 50% RDF + 40 kg S		6.76	8.04	61.22	71.00
SEm±	Y	0.09	0.09	0.47	0.56
	T	0.17	0.18	0.95	1.15
	Y × T	0.30	0.32	1.63	1.95
CD at 0.05	Y	0.25	0.26	1.33	1.59
	T	NS	NS	NS	NS
	Y × T	NS	NS	NS	NS
CV%		8.04	6.85	4.67	4.80

Table 2: Effect of integrated nutrient management on yield parameters of onion (Pooled)

Treatment		Bulb weight (g)	Equatorial diameter (cm)	Bulb yield (t/ha)
T_1: 100% RDF (75:60:50 NPK kg/ha)		54.63^{f}	5.23^{e}	35.25^{f}
T_2: 10 t FYM + 100% RDF (75:60:50 NPK kg/ha)		59.61^{de}	5.70^{bc}	38.74^{cde}
T_3 : 100% RDF (75:60:50 NPK kg/ha) + 20 kg S		56.55^{ef}	5.31^{de}	36.86^{ef}
T_4 : 100% RDF (75:60:50 NPK kg/ha) + 40 kg S		59.47^{de}	5.67^{bc}	38.81^{cde}
T_5: 25% RDN through FYM + 75% RDF + 20 kg S		58.21^{de}	5.42^{cde}	37.78^{de}
T_6: 25% RDN through FYM + 75% RDF + 40 kg S		60.45^{cd}	5.74^{bc}	39.04^{cde}
T_7: 25% RDN through VC + 75% RDF + 20 kg S		61.68^{bcd}	5.73^{bc}	39.86^{bcd}
T8: 25% RDN through VC + 75% RDF + 40 kg S		63.72^{abc}	5.91^{ab}	41.08^{abc}
T_9: 50% RDN through FYM + 50% RDF + 20 kg S		58.08^{de}	5.53^{cde}	37.35^{def}
T_{10}: 50% RDN through FYM + 50% RDF + 40 kg S		60.52^{cd}	5.63^{bcd}	39.09^{bcde}
T_{11}: 50% RDN through VC + 50% RDF + 20 kg S		64.34^{ab}	5.96^{ab}	41.65^{ab}
T_{12}: 50% RDN through VC + 50% RDF + 40 kg S		65.54^{a}	6.13^{a}	42.83^{a}
SEm±	Y	0.05	0.05	0.42
	T	0.10	0.10	0.77
	Y × T	0.18	0.18	1.45
CD at 0.05	Y	NS	NS	1.18
	T	Sig	Sig	Sig
	Y × T	NS	NS	NS
CV%		5.96	5.64	6.41

Note: Treatment means with the letter/letters in common are not significant by Duncan's New Multiple Range Test at 5% level of significance

Table 3: Effect of integrated nutrient management on economic of onion (Pooled)

Treatments		Yield (t/ha)	Gross income (₹/ha)	Total cost of cultivation (₹/ha)	Net realization (₹/ha)
T_1	100% RDF (75:60:50 NPK kg/ha)	35.25	352500	80967	271533
T_2	10 t FYM + 100% RDF (75:60:50 NPK kg/ha)	38.74	387400	91883	295517
T_3	100% RDF (75:60:50 NPK kg/ha) + 20 kg S	36.86	368600	81076	287524
T_4	100% RDF (75:60:50 NPK kg/ha) + 40 kg S	38.81	388100	81185	306915
T_5	25% RDN through FYM + 75% RDF + 20 kg S	37.78	377800	81806	295994
T_6	25% RDN through FYM + 75% RDF + 40 kg S	39.04	390400	81915	308485
T_7	25% RDN through VC + 75% RDF + 20 kg S	39.86	398600	90725	307875
T_8	25% RDN through VC + 75% RDF + 40 kg S	41.08	410800	90834	319966
T_9	50% RDN through FYM + 50% RDF + 20 kg S	37.35	373500	82533	290967
T_{10}	50% RDN through FYM + 50% RDF + 40 kg S	39.09	390900	82643	308257
T_{11}	50% RDN through VC + 50% RDF + 20 kg S	41.65	416500	100366	316134
T_{12}	50% RDN through VC + 50% RDF + 40 kg S	42.83	428300	100475	327825

Conclusion

From the three years of field study, it can be concluded that application of 50% RDN through VC + 50% RDF + 40 kg S recorded maximum bulb weight, bulb equatorial diameters, bulb yield and net return (3, 27,825 ₹/ha) in onion cv GJRO 11.

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Conflict of Interest
None.

References
1. Anonymous. Directorate of Horticulture, Gujarat State, Gandhinagar. 2021.
2. Anonymous. Horticultural Statistics at a Glance. Horticulture Statistics Division, Department of Agriculture, Co-operation & Farmers Welfare, Ministry of Agriculture and Farmers Welfare, Government of India; 2021.
3. Datt N, Sharma RP, Sharma GD. Effect of supplementary use of farmyard manure along with chemical fertilizers on productivity and nutrient uptake by vegetable pea (*Pisum sativum* var. *arvense*) and buildup of soil fertility in Lahul valley of Himachal Pradesh. Indian J Agric Sci. 2003;73:266-268.
4. Dilpreet T, Singh K, Singh J. Effect of bio fertilizers on soil microbial count, nutrient availability and uptake under November sown onion. J Appl Nat Sci. 2017;9(1):55-59.
5. Kwaghe EK, Saddiq AM, Solomon RI, Musa SA. Integrated nutrient management on soil properties and nutrient uptake by red onion. Turk J Agric-Food Sci Technol. 2017;5(5):471-475.
6. Mishu HM, Ahmed F, Rafii MY, Faru G, Latif MA. Effect of sulfur on growth, yield and yield attributes in onion (*Allium cepa* L.). Aust J Crop Sci. 2013;7:1416-1422.
7. Pandey N, Verma AK, Anurag, Tripathi RS. Integrated nutrient management in transplanted hybrid rice (*Oryza sativa*). Indian J Agron. 2007;52:40-42.
8. Panse VG, Sukhatme PV. Statistical Methods for Agricultural Workers. 5th ed. New Delhi: Indian Council of Agricultural Research; 1989.
9. Rathod NB, Khandare RN, Karle AS. Effect of organic, inorganic and integrated nutrient management on yield attributes, production of onion and soil properties, under vertisol of Maharashtra. Int J Chem Stud. 2020;8(1):937-940.
10. Sharma RP, Datt N, Chander G. Effect of vermicompost, FYM, and chemical fertilizers on yield and nutrient uptake and soil fertility in okra-onion sequence in wet temperate zone of Himachal Pradesh. J Indian Soc Soil Sci. 2009;57(3):357-361.
11. Sharma SK, Garhwal OP, Mahala P, Yadav TV. Influence of integrated nutrient management on yield attributes and economics of kharif onion (*Allium cepa* L.) under loamy sand soils. Int J Curr Microbiol Appl Sci. 2018;7(6):2806-2811.
12. Sharma S, Dubey YP, Kaistha BP, Verma TS. Effect of Rhizobium inoculation and phosphorus level on symbiotic parameters, growth and yield of French bean (*Phaseolus vulgaris* L.) in north-western acid Alfisol. Legume Res. 2005;28:103-106.
13. Singh L, Bhonde SR, Mishra VK. Effect of different organic manures and inorganic fertilizers on yield and quality of rabi onion. News Lett Natl Hort Res Dev Found. 1997;17(3):1-3.
14. Singh RP, Jain NK, Poonia BL. Integrated nutrient management in rainy-season onion (*Allium cepa*). Indian J Agric Sci. 2001;71(5):310-312.
15. Thangasamy A, Lawande KE. Integrated nutrient management for sustainable onion production. Indian J Hort. 2015;72(3):347-352.
16. Zaman MS, Hashem MA, Jahiruddin M, Rahim MA. Effect of sulphur fertilization on the growth and yield of garlic (*Allium sativum* L.). Bangladesh J Agric Res. 2011;36(4):69-78.