

Effect of Organic Nutrient Management Practices on Yield and Quality of Onion

Rajesh Meena¹, Virendra Singh¹, R.A. Kaushik¹, S.K. Sharma², H.K. Jain³,
R.N. Bunker⁴ and Jagdeesh Prasad Rathore¹

¹Department of Horticulture, ³Department of Statistics, ⁴Department of Plant Pathology,
Rajasthan College of Agriculture, MPUAT, Udaipur, Rajasthan, India
²ICAR-New Delhi, India

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ABSTRACT

This investigation was conducted at Sericulture Farm, Department of Horticulture, Rajasthan College of Agriculture, MPUAT-Udaipur (Raj.) during *Rabi* season 2020-21 and 2021-22. The experiment comprised of 12 treatments with three replications were conducted over a two-year period, specifically from 2020-21 to 2021-22. Among the various organic treatments, T₇ (50% of RDN through FYM + 50% of RDN through Neem cake + Panchagavya spray @ 3% + Vermiwash spray @ 5% at 30, 50 & 70 DAT + Jeevamrut @ 500 L ha⁻¹ six times at 20 days intervals) was superior in respect to neck diameter at harvest (0.89 & 0.93 cm), diameter of bulb (5.43 & 5.81 cm), Average bulb weight (68.09 & 70.02 g), total soluble solid (16.77 & 17.03 %), pungency (5.95 & 6.24 µmol/g), bulb shape index (0.86 & 0.87) and dry matter content (15.70 & 15.91 %) content as compared to other treatments.

Key words: Organic nutrient, Onion, Yield and quality.

Introduction

The onion, scientifically known as *Allium cepa* L., is a member of the *Alliaceae* family and is considered to be one of the most significant commercial vegetable crops grown in India. The onion, following the tomato, is widely regarded as the second most significant vegetable crop cultivated on a global scale (Mishra *et al.*, 2013). Onion exhibits a semi-perishable characteristic and possesses the ability to endure transportation over extended distances with minimal damage (Mahala *et al.*, 2018). It is commonly denoted as the “Queen of the Kitchen”. The appeal of the onion lies in its distinct flavor and pungency, which can be attributed to the existence of a volatile oil known as “allyl propyl disulphide.” This organic compound is notably abundant in element

sulphur (Mondal *et al.*, 2020). The onion possesses notable medicinal properties. The compound known as “quercetin,” which is found in onions, exhibits potent antioxidant properties (David *et al.*, 2016). In light of rising demand for high-quality food, environmentally sustainable crop growing becomes a realistic option. The goal can be achieved with organic farming. Organic farming uses natural inputs to grow crops without chemical fertilizers or pesticides, which are harmful to the environment.

Materials and Methods

This work was carried out at Sericulture Farm, RCA, Udaipur, situated under agro-climatic condition of the sub-humid southern plain of Rajasthan state (India). The research work was subjected to Random-

ized Block Design with 20 treatments and three replications. We prepared and used different types of organic manures (FYM and Neem cake) and organic liquid (Panchgavya, Jeevamrut, Vermiwash, PROM, Beejamrutha and Ghan Jeevamrut).

Nursery raising: The soil in the nursery area was fine-tilled, harrowed, and ploughed. A three-meter-long, one-meter-wide raised bed that was 15 cm above the ground was constructed, and the top soil was well mixed with sand and FYM (in accordance with treatments). Following that, seeds were placed on well-prepared raised beds in rows, 10 cm apart. Transplanted two-month-old seedlings with consistent growth were spaced 15 by 10 cm apart in the experimental plot.

Observations recorded

Neck diameter - The thickness of the neck region located below the leaf lamina joint was quantified using a Vernier caliper, with measurements recorded in centimeters.

Bulb diameter - The measurement of bulb equatorial diameters of 5 bulbs from each plot was conducted using vernier calliper, the mean value was calculated and reported as the bulb's diameter in centimeters.

Bulb weight - The weight of bulbs was meticulously documented subsequent to the curing process on all the observational plants within each plot and recorded in grams.

TSS - Utilizing a manual refractometer and expressed in percentage.

Pungency - The determination of allyl propyl disulphide content in onion bulb was conducted using pyruvic acid as a means to assess pungency (Hort and Fisher, 1970).

Bulb shape index - Shape index is used to evaluate the shape of onion bulbs and it is calculated according to the following equation

$$\text{Shape index} = \frac{D_s}{\sqrt{D_p \times T}}$$

Dry matter content - The following equation is then used to calculate the dry matter content: (Dry weight / wet weight) x 100 = percentage of dry matter.

Results

The data of several parameters recorded after harvest of onion crop were significantly influenced by different organic manures and liquid at 5 % level of significance during both the years of study, i.e. 2020-21 & 2021-22 as well as in pooled analysis (Table 1 & 2). Notably, the best treatment T₂ with having the desirable highest values of parameters during 2020-21 & 2021-22 and in pooled analysis viz., neck diameter (0.90, 0.94 & 0.92 cm), bulb diameter (5.57, 5.82 & 5.69 cm), average bulb weight (69.29, 71.55 & 70.42 g), TSS (16.95, 17.22 & 17.09 %), pungency (5.99, 6.27 & 6.13 µmol/g), bulb shape index (0.86, 0.87 & 0.87) and dry matter content (10.80, 10.97 & 10.89 %).

Table 1. Effect of organic nutrient management practices on neck diameter (cm), bulb diameter and average bulb weight of onion

Treatment Symbol	Neck diameter (cm) at harvest			Bulb diameter (cm)			Average bulb weight (g)		
	2020-21	2021-22	Pooled	2020-21	2021-22	Pooled	2020-21	2021-22	Pooled
T ₁	0.82	0.84	0.83	3.69	4.04	3.86	48.52	49.53	49.03
T ₂	0.90	0.94	0.92	5.57	5.82	5.69	69.29	71.55	70.42
T ₃	0.83	0.84	0.83	4.53	4.95	4.74	55.35	56.39	55.87
T ₄	0.89	0.90	0.89	5.39	5.62	5.51	66.91	69.57	68.24
T ₅	0.87	0.89	0.88	5.10	5.52	5.31	62.79	63.69	63.24
T ₆	0.85	0.87	0.86	4.65	5.09	4.87	57.72	59.10	58.41
T ₇	0.89	0.93	0.91	5.43	5.81	5.62	68.09	70.02	69.06
T ₈	0.82	0.85	0.84	4.77	5.20	4.99	59.68	61.07	60.38
T ₉	0.82	0.84	0.83	4.57	5.02	4.80	58.00	59.19	58.60
T ₁₀	0.85	0.86	0.85	4.32	4.76	4.54	52.79	53.50	53.15
T ₁₁	0.86	0.88	0.87	4.30	4.82	4.56	54.93	55.78	55.36
T ₁₂	0.88	0.90	0.89	5.12	5.54	5.33	64.35	66.01	65.18
S.E. (m) (±)	0.01	0.02	0.01	0.14	0.10	0.09	1.69	1.12	1.02
C.D. at 5%	0.03	0.04	0.03	0.42	0.28	0.25	4.97	3.29	2.90

Table 2. Effect of organic nutrient management practices on TSS, pungency, bulb shape index and dry matter content of onion

Treatment Symbol	TSS			Pungency			Bulb shape index			Dry matter content		
	2020-21	2021-22	Pooled	2020-21	2021-22	Pooled	2020-21	2021-22	Pooled	2020-21	2021-22	Pooled
T ₁	0.82	0.84	0.83	3.69	4.04	3.86	48.52	49.53	49.03	14.36	15.04	14.70
T ₂	0.90	0.94	0.92	5.57	5.82	5.69	69.29	71.55	70.42	15.80	15.97	15.89
T ₃	0.83	0.84	0.83	4.53	4.95	4.74	55.35	56.39	55.87	14.77	15.14	14.96
T ₄	0.89	0.90	0.89	5.39	5.62	5.51	66.91	69.57	68.24	15.47	15.89	15.68
T ₅	0.87	0.89	0.88	5.10	5.52	5.31	62.79	63.69	63.24	15.24	15.64	15.44
T ₆	0.85	0.87	0.86	4.65	5.09	4.87	57.72	59.10	58.41	14.89	15.45	15.17
T ₇	0.89	0.93	0.91	5.43	5.81	5.62	68.09	70.02	69.06	15.70	15.91	15.81
T ₈	0.82	0.85	0.84	4.77	5.20	4.99	59.68	61.07	60.38	14.87	15.33	15.10
T ₉	0.82	0.84	0.83	4.57	5.02	4.80	58.00	59.19	58.60	14.78	15.27	15.03
T ₁₀	0.85	0.86	0.85	4.32	4.76	4.54	52.79	53.50	53.15	14.88	15.39	15.14
T ₁₁	0.86	0.88	0.87	4.30	4.82	4.56	54.93	55.78	55.36	15.05	15.53	15.29
T ₁₂	0.88	0.90	0.89	5.12	5.54	5.33	64.35	66.01	65.18	15.37	15.74	15.56
S.E. (m) (±)	0.01	0.02	0.01	0.14	0.10	0.09	1.69	1.12	1.02	0.17	0.10	0.10
C.D. at 5%	0.03	0.04	0.03	0.42	0.28	0.25	4.97	3.29	2.90	0.50	0.28	0.28

Discussion

The treatment T₂ (recommended dose of fertilizer) with T₇ (50% of RDN through FYM + 50% of RDN through Neem cake + Panchagavya spray @ 3% + Vermiwash spray @ 5% at 30, 50 & 70 DAT + Jeevamrut @ 500 L ha⁻¹ six times at 20 days intervals) at par was found superior of this study indicates that the different organic manures and liquid has notable impact on various parameters that was examined across all treatments. Potassium, a crucial element, performs a pivotal function in the preservation of cellular structure. Potassium stabilises emulsions with remarkably colloidal properties, thereby contributing to the substantial neck girth observed in plants Singh *et al.* (2021) similar results were found by Biru, (2015). The available P and K through inorganic fertilizers might have helped the plant in increasing Bulb equatorial and polar diameter (cm) by Kumar *et al.*, 2019 and similar results found by Hawkesford *et al.*, 2012. Enhancement in bulb weight may be ascribed to Phosphorus impact on the allocation of assimilates towards the growth and development of bulbs, as proposed by Aliyu *et al.* (2007). Behairy *et al.* (2015) found similar result while working on onion. Increased photosynthetic activity of the plants, which was aided by the availability of inorganic nitrogen, there was a greater accumulation of food material i.e., carbohydrates in the bulb, which synthesised to saccharides, and there was an increase in TSS content by Pal *et al.*, 2020. The similar result have also been reported by Bairwa *et al.* (2022) in onion. Mojsevich (2008) who

reported that with the increase of doses of the main fertilizer N, P and K 70, 45, 70 kg ha⁻¹ to N, P and K 110, 75, 110 kg ha⁻¹ caused the increase of dry matter content in bulbs from 14.6% to 15.5%.

Conflict of Interest- None

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