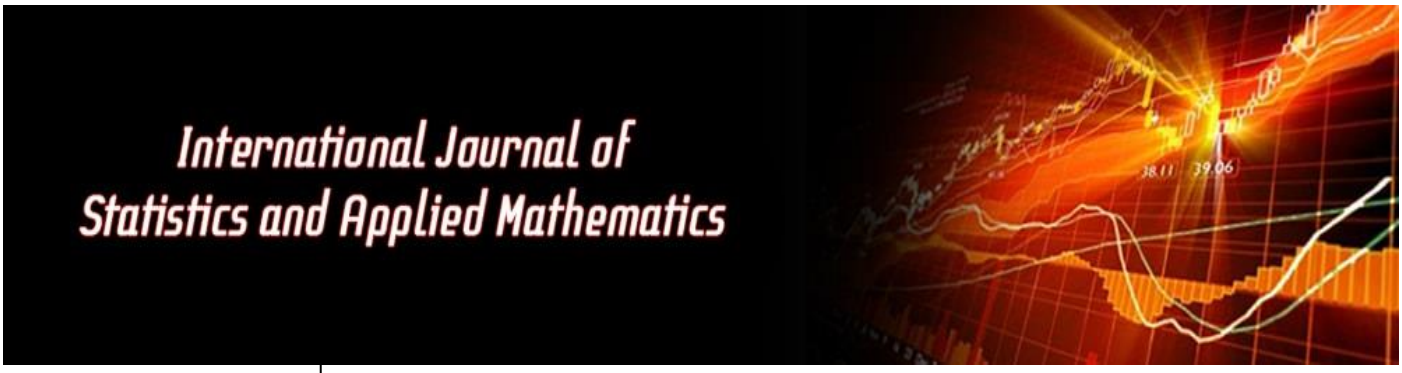

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Effect of integrated nutrient management on growth, yield, quality and nutrient uptake of onion [*Allium cepa* (L.)] Varieties

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Abstract
The present investigation entitled "Effect of integrated nutrient management on growth, yield, quality and nutrient uptake of onion [*Allium cepa* (L.)] Varieties." was carried out during two consecutive seasons of 2021-22 and 2022-23 the experiment was conducted at fields of university, Bhopal (M.P.). This experiments has been conducted in 12 treatments and two verities and their 24 combinations, with three replications. The experiment has formed under Factorial Randomized Design. In the experiment the 12 treatments of integrated nutrient management such as F_1-PM (2 t/ha), F_2-FYM (6 t/ha), F_3-VC (5 t/ha), F_4-50% RDF, F_5-50% RDF + PM, F_6-50% RDF + FYM, F_7-50% RDF + VC, F_8-75% RDF, F_9-75% RDF + PM, F_{10}-75% RDF + FYM, F_{11}-75% RDF + VC and F_{12}-100% RDF, Two varieties are used in the experiments such as V_1 (Nasik Red) and V_2 (Agrifound Dark Red). The observations to be recorded under the experiments are Morphological parameters like Plant height (cm) at 90 and 120 DAT, Length of leaf (cm) at 90 and 120 DAT, Number of leaves per plant at 90 and 120 DAT, Neck diameters of plant at 90 and 120 DAT. Yield-attributing parameters like Moisture Content %, Bulb weight (g) and Yield/plot (kg). The result revealed that the maximum plant height at 90 and 120 DAT, Length of leaf at 90 and 120 DAT, Number of leaves per plant at 90 and 120 DAT, Neck diameters of plant at 90 and 120 DAT, yield-attributing parameters like moisture content %, bulb weight and yield/plot was observed under variety V_2 (Agrifound Dark Red) and in case of fertilizer application all the parameters was found under treatment F_{12} [100% RDF ($N_{120}P_{80}K_{80}$)], in case of combined application of variety and fertilizers treatment combination V_2F_{12} [Agrifound Dark Red + 100% RDF ($N_{120}P_{80}K_{80}$)] was observed better compare to other combinations, while the minimum was observed under the treatments control.

Keywords: Onion, Bulb, INM, nutrient uptake

Introduction
One of the most significant vegetable crops and spices in the world, especially in India, belongs to the onion (*Allium cepa* L.). India is the globe's second-biggest producer of onions. Having an overall share of 35.05% in onions results in 2019–20, Maharashtra is ranked top in India. The estimated area of onion is 1200 thousand hectares and production of 217 lakh tonnes with average productivity of 18.3 MT/ha. Maharashtra, Gujarat, Uttar Pradesh, Rajasthan, Orissa, Karnataka, Tamil Nadu, Madhya Pradesh, and Bihar are the states which grow the greatest quantity of onions. With a 19% productivity share, Maharashtra leads the world in onion production. The main districts in Maharashtra for growing onions are Satara, Nashik, Jalgaon, Pune, Solapur, and Ahmednagar, all of which account for 94.68% of the state's entirety planted with onions. Onion growers grow Kharif and Rabi onions in particular in a small area inside the Satara district of the state (Barakade *et al.*, 2011) [9].
Applying various forms of organic matter in soils enhances the health and efficiency of soil properties, reduces the deficiency of micronutrients, promotes the growth of a variety of soil microorganisms, and strengthens the Rhizosphere's ecological balance (Sanwal *et al.*, 2007) [36]. In organic production, weeds, pests, and diseases are managed using a variety of management strategies that maintain the soil's fertility overall quality. One important aspect of achieving the aforementioned goals is the rotation of crops. The herbicides, chemical pesticides, and traditional fertilizers that contain chemicals are banned; however, "organic" products are often accepted as long as they meet the organic criteria.

Due to individual and collective efforts to protect the environment and prevent agricultural produce from being contaminated by the use of chemical pesticides and fertilizers, organic agriculture is becoming more and more popular in India. Crop diversity is maintained by the organic food movement, which supports ecological soundness and sustainable resource usage. The primary driver of the organic onion industry's growth is customer choice. Produce grown organically is far more favored than conventionally farmed onions. This results in a wider range and assortment of veggies available in restaurants, supermarkets, and retail stores. In this regard, the scientific production of organically produced onions has received very little attention.

Materials and Methods

The present investigation entitled "Effect of integrated nutrient management on growth, yield, quality and nutrient uptake of onion [*Allium cepa* (L.)] Varieties." was carried out during two consecutive seasons of 2021-22 and 2022-23 the experiment was conducted at fields of university, Bhopal (M.P.). This experiments has been conducted in 12 treatments and two verities and their 24 combinations, with three replications. The experiment has formed under Factorial Randomized Design. In the experiment the 12 treatments of integrated nutrient management such as F_1-PM (2 t/ha), F_2-FYM (6 t/ha), F_3-VC (5 t/ha), F_4-50% RDF, F_5-50% RDF + PM, F_6-50% RDF + FYM, F_7-50% RDF + VC, F_8-75% RDF, F_9-75% RDF + PM, F_{10}-75% RDF + FYM, F_{11}-75% RDF + VC and F_{12}-100% RDF, Two varieties are used in the experiments such as V_1 (Nasik Red) and V_2 (Agrifound Dark Red). The observations to be recorded under the experiments are plant height (cm) at 90 and 120 DAT, length of leaf (cm) at 90 and 120 DAT, number of leaves per plant at 90 and 120 DAT, Neck diameters of bulb at 90 and 120 DAT, moisture content %, Bulb weight (g) and yield/plot (kg).

Neck diameters of bulb

The neck diameter of the bulb was measured in cm at the successive stage of growth with the help of Vernier calipers.

Moisture Content %

It was calculated by the following formula:

$$\% \text{ moisture} = \frac{\text{Fresh weight of bulb} - \text{Dry weight of bulb}}{\text{Fresh weight of bulb}} \times 100$$

Results and Discussions

Plant height (cm) at 90 and 120 DAT

Variety V_2 has recorded maximum plant height at the different growth stages like 90 (47.95 cm) and 120 (39.46 cm) days after transplanting of the onion crop in pooled year basis, while the minimum (44.08 and 51.06 cm) plant height was measured in same year found in the variety V_1. Plant height is determined by the genetic characteristics of the variety; hence, variations in these characteristics were eventually observed among different kinds. This conclusion is consistent with Mohanty and Prusti's (2001) [27] findings.

In the fertilizer application for observing plant height (cm) at the different growth stages like 90 DAT (49.34) and 120 DAT (55.93) days after transplanting of the onion crop the treatment applied in F_{12} [100% RDF ($N_{120}P_{80}K_{80}$)] has showed maximum plant height in pooled year basis, followed by the treatment F_{11} (75% RDF + VC) 90 DAT (48.12) and 120 DAT (54.78) and F_{10} (75% RDF + FYM) 90 DAT (42.57) and 120 DAT (54.61), while the minimum was found under the F_1 [PM (2 t/ha)] (42.17 and 49.76). This may be because plants absorb a great deal of N, P, and K when fertilizers are applied than when they do not, which may have had a substantial physiological impact on the plants' total growth and development. Bairagi *et al.*, 2015 [8].

The treatment combination V_2F_{12} [Agrifound Dark Red + 100% RDF ($N_{120}P_{80}K_{80}$)] was found maximum plant height at 90 DAT (53.83) and 120 DAT (56.18), followed by the all other treatment combinations. The minimum (40.63 and 49.62) plant height was recorded under the treatment combination V_1F_1 [Nasik Red + PM (2 t/ha)] at 90 DAT and 120 DAT (40.63 and 49.62). The reason for the plant's increased height when nitrogen fertilizers are applied in combination with RDF could be because nitrogen serves as a building block for the synthesis of amino acids, which combine to form proteins and metabolic processes essential for plant growth. Similar results have been reported by Amans *et al.*, (1996) [4], Kumar *et al.*, (1998) [26], Khan *et al.*, (2002) [24], El-Shaikh (2005) [14], Shaheen *et al.*, (2007) [38] and Abdissa *et al.*, (2011) [9]. The same was reported by according to Kalirawna, treatment provides a good amount of fertilizer and nutrients for their growth. Plant height may likely rise as a result of improved nutrient uptake from the soil and efficient transport of nutrients to different plant sections through the use of inorganic and organic fertilizers. Since inorganic fertilizers supply essential elements during the early stages of plant growth and development, their rate of nutrient release is significantly higher. As a result, plants grew more quickly than they did with compost or other organic nutrients. Tindall (1968) [42] asserted that optimal growth and development at an early stage necessitate relatively high quantities of nutrients. Low nutritional element content and slow nutrient uptake by plants characterize compost (Brady, 1990) [11].

Length of leaf (cm) at 90 and 120 DAT

The variety V_2 has observed maximum length of leaf at all the stages of growth 90 and 120 DAT (39.46 and 38.24 cm), while the minimum length of leaf was measured in the variety V_1 (37.03 and 35.87). In the application of recommended dose of fertilizers in the form of treatment F_{12} [100% RDF ($N_{120}P_{80}K_{80}$)] has showed maximum (49.69 and 47.33) length of leaf at 90 and 120 DAT of onion crop, followed by the other treatment F_{11} (75% RDF + VC) (46.44 and 44.83) and F_{10} (75% RDF + FYM) (45.57 and 44.25), while the minimum length of leaf was recorded in treatment F_1 [PM (2 t/ha)] (33.58 and 32.46). Hence, chemical fertilizers speed up the early growth of onion leaves, but at later stages, organic manures may make up for it. Numerous species of living things are activated by organic manures, and this results in the release of phytohormones, which may promote plant growth and nutrient absorption (Arisha *et al.*, 2003) [45] and such organisms need nitrogen for multiplication (Ouda and Mahadeen, 2008) [30].

The combined application of nutrient and variety they are V_2F_{12} [Agrifound Dark Red + 100% RDF ($N_{120}P_{80}K_{80}$)] noted maximum (49.85 and 47.54) length of leaf at 90 and 120 DAT of onion crops, followed by the other combinations of treatments V_1F_{12} [Nasik Red + 100% RDF ($N_{120}P_{80}K_{80}$)] (49.54 and 47.13), V_2F_{11} (Agrifound Dark Red + 75% RDF + VC) (46.27 and 44.20) and V_2F_{10} (Agrifound Dark Red + 75% RDF + FYM) (45.03 and 46.16). The minimum length of leaf at the growth stages was recorded under the treatment combination V_1F_1 [Nasik Red + PM (2 t/ha)] (31.58 and 32.37). Nitrogen's beneficial effects on leaf length may result from its involvement in the creation of proteins, enzymes, and

chlorophyll. The findings of Jilani (2004) [22], who said that the application of 200 kg N ha^{-1} greatly increased the length of onion leaves, are consistent with the findings of this investigation. Similarly, Kumar *et al.,* (1998) [26] indicated that application of N at 150 kg ha^{-1} gave the best result with the regard to onion leaf length. Similarly Abdissa *et al.,* (2011) [9] also reported that Nitrogen application showed significant effect on onion leaf length.

Number of leaves per plant at 90 and 120 DAT

The Variety V_2 has been recorded maximum number of leaves per plant at 90 and 120 days after transplanting (8.46 and 7.23) and the minimum number (7.62 and 7.04) of leaves per plant was measured in variety V_1 at same growth stages.

The treatment F_{12} [100% RDF ($N_{120}P_{80}K_{80}$)] has showed maximum number (10.95 and 8.23) of leaves per plant at different growth stages like 90 and 120 days after transplanting, followed by the other treatments F_{11} (75% RDF + VC) (10.26 and 7.98) and F_{10} (75% RDF + FYM) (9.92, and 7.96), the minimum number of leaves per plant was recorded in treatment F_1 [PM (2 t/ha)] (6.55 and 6.71). This result is in agreement with the findings of El-Oksh *et al.,* (1993) [13]. They found that the amount of nitrogen applied significantly affected the onion's leaf count. According to Singh *et al.* (1989) [39], green manure and 120 kg N/ha produced the tallest plants with the most leaves per plant. Reddy and Reddy (2005) [33] also noted that 30 t/ha of vermicompost with 200 kg N/ha produced the greatest number of leaves per onion plant. Application of 80 kg N/ha increased the number of leaves/plant compared to 40 kg N/ha (Nehra *et al.,* 1988) [29]. Kumar *et al.,* (2001) [25] found that 130 kg N/ha resulted in the highest number of green leaves per plant of onion.

The combination of variety and recommended dose of chemical fertilisers in the treatment combination V_2F_{12} [Agrifound Dark Red + 100% RDF ($N_{120}P_{80}K_{80}$)] was found maximum number (11.14 and 8.38) of leaves per plant at the growth stages of plant, followed by the other treatment combinations like V_1F_{12} [Nasik Red + 100% RDF ($N_{120}P_{80}K_{80}$)] (10.76, and 8.07), V_2F_{11} (Agrifound Dark Red + 75% RDF + VC) (10.67 and 8.03) and V_2F_{10} (Agrifound Dark Red + 75% RDF + FYM) (10.10 and 8.01), the minimum number of leaves per plant at 90 and 120 DAT was recorded under the treatment combination V_1F_1 [Nasik Red + PM (2 t/ha)] (6.40 and 6.65). It is clearly showed that the variety V_2 showed better performance in the region with the combination of chemical fertilizers.

Neck diameter of bulb (cm) 90 and 120 DAT

The Variety V_2 (Agrifound Dark Red) has recorded maximum neck diameter (1.88 and 1.94) of bulb, which was at par with the variety V_1 (Nasik Red) (1.79, and 1.84).

In application of recommended dose of fertilisers applied in the treatment F_{12} [100% RDF ($N_{120}P_{80}K_{80}$)] has showed maximum neck diameter (2.75 and 2.77) of bulb at 90 and 120 DAT of onion, followed by the treatment F_{10} (75% RDF + FYM) (2.02 and 2.07) and F_{11} (75% RDF + VC) (2.05 and 2.23), while the minimum neck diameter of bulb was recorded in treatment F_1 [PM (2 t/ha)]. Similarly, increased neck diameter, Jawadagi *et al.,* (2012) [20] acquired bulb diameter and weight with the application of greater quantities of NPK fertilizer.

Treatment combination V_2F_{12} [Agrifound Dark Red + 100% RDF ($N_{120}P_{80}K_{80}$)] noted maximum neck diameter (2.79 and 2.81) of bulb at 90 and 120 DAT of onion crop, followed by the treatment combinations V_1F_{12} [Nasik Red + 100% RDF ($N_{120}P_{80}K_{80}$)] (2.72 and 2.74), V_2F_{11} (Agrifound Dark Red + 75% RDF + VC) (2.11 and 2.32), the minimum neck diameter of bulb at all the growth stages was recorded under the treatment combination V_1F_1 [Nasik Red + PM (2 t/ha)] (1.58 and 1.60). According to Subbaiah *et al.,* (1982) [40], the pattern solubilization of plant nutrients by the addition of organic manures may be responsible for the growth in neck diameter, bulb diameter, and length. This will increase N, P, and K absorption. Complex nitrogenous compounds that are progressively broken down by the addition of organic manure to the soil provide a consistent supply of nitrogen for the crop's growth period. This could have contributed to increased availability and the crop's subsequent uptake, raising the yield. Corroborative results were also reported by Patil *et al.,* (2005) [31]; Ethel *et al.,* (2009) [15]; Gami *et al.,* (2012) [17] and Bagali *et al.,* (2012) [7] in onion crop. Kumar *et al.,* (1998) [26] reported that they noticed an increase in onion crop neck diameter when chemical fertilizers were applied at higher rates of N and S application. According to Yohannes *et al.,* (2017) [42], the use of both inorganic and organic fertilizers together has a highly substantial impact on neck thickness, one of the crucial factors. Negasi *et al.,* (2017) [28], however, presented conflicting results. More rate of photosynthesis and absorption in plant tissues may be the cause of plants growing comfortably in terms of height, number of leaves per plant, and area of leaves per plant.

Moisture Content %

The Variety V_2 has recorded maximum (44.02 %) moisture content, followed by the variety V_1 (43.55 %). In same the application of recommended dose of fertilizers in the form of treatment F_{12} [100% RDF ($N_{120}P_{80}K_{80}$)] has showed maximum (52.54 %) moisture content per cent, followed by the treatment F_{11} (75% RDF + VC) (50.73 %), while the minimum moisture content was recorded in treatment F_1 [PM (2 t/ha)] (41.35%).

The treatment combination V_2F_{12} [Agrifound Dark Red + 100% RDF ($N_{120}P_{80}K_{80}$)] noted maximum (52.56 %) moisture content, which was at par with the treatment combination V_1F_{12} [Agrifound Dark Red + 100% RDF ($N_{120}P_{80}K_{80}$)] (52.53 %), while the minimum moisture content was recorded under the treatment combination V_1F_1 [Nasik Red + PM (2 t/ha)] (41.30 %).

Bulb weight (g)

The results of pooled basis Variety V_2 (Agrifound Dark Red) has recorded maximum (58.69 g) bulb yield, followed by the variety V_1 (Nasik Red) (58.06 g). In the same manner application of recommended dose of fertilizers in the mean of the treatment F_{12} [100% RDF ($N_{120}P_{80}K_{80}$)] has showed maximum (70.06 g) bulb yield, followed by the treatment F_{11} (75% RDF + VC) (67.63 g), while the minimum bulb yield was recorded in treatment F_1 [PM (2 t/ha)] (55.13 g). According to Gamiely *et al.,* (1991) [18], applying nitrogen and potassium after planting can frequently enhance the size of the bulb and the number of bulblets that grow. Onion is a heavy feeder plant that responds well to both organic and inorganic manures, according to Purseglove (1972) [32]. This findings are in conformity with the results reported by (Abbey *et al.,* 2000) [2].

The treatment combination V_2F_{12} [Agrifound Dark Red + 100% RDF ($N_{120}P_{80}K_{80}$)] noted maximum (70.08 g) bulb yield, which was at par with the treatment combination V_1F_{12} [Agrifound Dark Red + 100% RDF ($N_{120}P_{80}K_{80}$)] (70.04 g), followed by the treatment combinations V_2F_{11} (Agrifound

Dark Red + 75% RDF + VC) (67.92 g) and V_2F_{10} (Agrifound Dark Red + 75% RDF + FYM) (67.40 g), while the minimum bulb yield was recorded under the treatment combination V_1F_1 [Nasik Red + PM (2 t/ha)] (55.07 g). In order to maximize the number of bulbs per plant, soil structure may have an impact on onion bulb production at the time of bulb commencement. The amount of organic matter in the soil is increased by adding organic fertilizer. When inorganic fertilizers are present, soil micro and macro organism activity is decreased in comparison to that of organic fertilizers. The result of Jeyarani (1986) [21], which stated that the addition of organic manures at a higher rate increases the total porosity greatly, supports this. Vermicompost gives soil organisms a better environment and maximizes their activity levels. In particular, compost encourages soil microbial activity. On the other hand, increasing the study's fresh weight of the entire plant and bulb size-two yield attributes-by applying organic and NPK fertilizers together resulted in a higher onion yield. Furthermore, increased plant nutrient supply and enhanced chemical, physical, and biological qualities of the soil may be the cause of the positive effects of organic and inorganic manures on yield (Datt *et al.*, 2003) [12]. Our findings closely matched those of Abbey *et al.*, (2000) [2], Bhati *et al.*, (2018) [10], and Gererufael *et al.*, (2020) [19], who found that increased amounts of both organic and inorganic fertilizers increased the yield of onion bulbs.

Yield/plot (kg)

The Variety V_2 (Agrifound Dark Red) has recorded maximum (28.17 kg/plot) yield per plot, while minimum (27.87 kg/plot) yield per plot was measured in variety V_1 (Nasik Red). In the application of recommended dose of fertilizers in the form of treatment F_{12} [100% RDF ($N_{120}P_{80}K_{80}$)] has showed maximum (33.63 kg/plot) yield per plot, followed by the treatment F_{11} (75% RDF + VC) and F_{10} (75% RDF + FYM) (32.46 kg/plot), while the minimum yield per plot was recorded in treatment F_1 [PM (2 t/ha)] (26.46 kg/plot). Concentrated kinds of soil nutrients, known as inorganic fertilizers, are more easily transported than manure. The nutrients released by organic manures are absorbed indirectly by the plants, who take a very long time to absorb them. Consequently, at the crucial phase of crop formation, plants are unable to obtain the necessary quantity of nutrients. This could be the likely cause of the increased yield that the onion treated with inorganic fertilizer produced. A similar outcome was attained by Seran and colleagues (2010) [36].

The combination V_2F_{12} [Agrifound Dark Red + 100% RDF ($N_{120}P_{80}K_{80}$)] noted maximum (33.64 kg/plot) yield per plot, which was at par with the treatment combinations V_1F_{12} [Agrifound Dark Red + 100% RDF ($N_{120}P_{80}K_{80}$)] (33.62 kg/plot), followed by the treatment combinations V_2F_{11} (Agrifound Dark Red + 75% RDF + VC) (32.60 kg/plot) and V_2F_{10} (Agrifound Dark Red + 75% RDF + FYM) (32.35 kg/plot), while the minimum yield per plot was recorded under the treatment combination V_1F_1 [Nasik Red + PM (2 t/ha)] (26.44 kg/plot). Both organic manure and the recommended amount of inorganic fertilizers were applied. Not only would the nutrients from the inorganic fertilizer have contributed to the ultimate output, but also the nutrients produced by the vermicompost. It could be the cause of the high yield that this treatment has produced. Therefore, using both organic and inorganic fertilizers together may result in higher yields than using just organic manure alone. The current conclusion was in line with earlier research on broccoli (Ouda and Mahadeen, 2008) [30], tomatoes (Babajide *et al.*, 2008), and onions (Abbey and Kanton, 2003; Gambo *et al.*, 2008) [6, 1, 16].

Table 1: Effect of integrated nutrient management on growth and yield parameters of onion.

Treat.	Plant Height AT 90 DAT	Plant Height AT 120 DAT	Length of the leaf (cm) at 90 DAT	Length of the leaf (cm) at 120 DAT	Number of Leaves per Plant 90 DAT	Number of Leaves per Plant 120 DAT	Neck diameter of the bulb (cm) 90 DAT	Neck diameter of the bulb (cm) 120 DAT	Moisture Content %	Bulb weight (g)	Yield/plot (kg)
	Pooled	Pooled	Pooled	Pooled	Pooled	Pooled	Pooled	Pooled	Pooled	Pooled	Pooled
V_1	44.08	51.06	37.03	35.87	7.62	7.04	1.79	1.84	43.55	58.06	27.87
V_2	47.95	51.62	39.46	38.24	8.46	7.23	1.88	1.94	44.02	58.69	28.17
S.Em±	0.023	0.013	0.030	0.029	0.007	0.003	0.002	0.002	0.024	0.032	0.015
CD 5%	0.065	0.038	0.083	0.082	0.020	0.008	0.005	0.005	0.067	0.089	0.043
F_1	42.17	49.76	33.58	32.46	6.55	6.71	1.65	1.68	41.35	55.13	26.46
F_2	47.17	50.41	36.10	34.86	7.89	6.95	1.79	1.82	41.80	55.73	26.75
F_3	47.43	50.62	37.66	36.06	8.03	7.01	1.84	1.86	41.89	55.85	26.81
F_4	43.09	51.69	38.53	36.96	8.28	7.19	1.68	1.69	43.34	57.79	27.74
F_5	47.40	51.98	43.29	42.86	8.33	7.22	1.95	1.90	43.43	57.91	27.80
F_6	46.13	52.43	43.91	42.37	8.74	7.38	1.90	1.96	43.67	58.22	27.95
F_7	43.25	52.68	40.91	40.25	8.96	7.43	1.87	1.89	47.45	63.26	30.37
F_8	47.53	53.32	41.92	41.50	9.32	7.60	1.92	1.94	48.49	64.66	31.04
F_9	47.98	53.56	44.13	43.11	9.49	7.72	2.00	2.01	48.60	64.80	31.10
F_{10}	42.57	54.61	45.57	44.25	9.92	7.96	2.02	2.07	49.84	66.45	31.90
F_{11}	48.12	54.78	46.44	44.83	10.26	7.98	2.05	2.23	50.73	67.63	32.46
F_{12}	49.34	55.93	49.69	47.33	10.95	8.23	2.75	2.77	52.54	70.06	33.63
S.Em±	0.056	0.033	0.072	0.072	0.017	0.007	0.004	0.004	0.058	0.078	0.037
CD at 5%	0.158	0.093	0.203	0.202	0.049	0.020	0.012	0.012	0.163	0.218	0.105

Table 2: Interaction effect of Variety and nutrient on growth and yield parameters of onion

Treatment	Plant Height AT 90 DAT	Plant Height AT 120 DAT	Length of the leaf (cm) at 90 DAT	Length of the leaf (cm) at 120 DAT	Number of leaves per plant at 90 DAT	Number of leaves per plant at 120 DAT	Neck diameter of the bulb (cm) at 90 DAT	Neck diameter of the bulb (cm) at 120 DAT	Moisture Content %	Bulb weight (g)	Yield/plot (kg)
	Pooled	Pooled	Pooled	Pooled	Pooled	Pooled	Pooled	Pooled	Pooled	Pooled	Pooled
V_1F_1	40.63	49.62	33.51	32.37	6.40	6.65	**1.58**	**1.60**	41.30	55.07	26.44
V_1F_2	47.07	50.30	35.96	34.74	7.80	6.89	1.72	1.74	41.40	55.20	26.49
V_1F_3	45.49	50.37	37.55	35.95	7.89	6.98	1.78	1.80	41.49	55.32	26.55
V_1F_4	40.92	51.29	38.43	36.87	8.21	7.10	1.64	1.65	43.26	57.68	27.68
V_1F_5	41.72	51.66	39.81	38.46	8.28	7.11	1.82	1.82	43.34	57.79	27.74
V_1F_6	50.52	52.34	40.14	38.63	8.66	7.35	1.95	1.97	43.63	58.17	27.92
V_1F_7	40.98	52.53	40.17	39.64	8.93	7.41	1.91	1.93	47.42	63.23	30.35
V_1F_8	47.32	53.06	40.29	39.74	9.06	7.50	1.97	1.99	48.05	64.06	30.75
V_1F_9	46.27	53.41	41.87	41.00	9.29	7.56	1.95	1.96	48.12	64.15	30.79
V_1F_{10}	41.12	54.27	43.79	43.50	9.74	7.91	2.00	2.02	49.12	65.50	31.44
V_1F_{11}	42.40	54.48	46.61	45.46	9.85	7.94	1.98	2.13	50.51	67.35	32.33
V_1F_{12}	44.57	55.69	49.54	47.13	10.76	8.07	2.72	2.74	52.53	70.04	33.62
V_2F_1	45.25	49.90	33.66	32.54	6.71	6.78	1.71	1.75	41.39	55.19	26.49
V_2F_2	47.27	50.52	36.24	34.97	7.97	7.01	1.86	1.89	42.20	56.27	27.01
V_2F_3	49.37	50.88	37.78	36.17	8.16	7.04	1.91	1.93	42.29	56.39	27.06
V_2F_4	43.71	52.08	38.64	37.04	8.35	7.27	1.71	1.73	43.43	57.90	27.79
V_2F_5	53.07	52.30	46.77	47.25	8.37	7.33	2.09	1.98	43.52	58.03	27.85
V_2F_6	48.16	52.52	47.68	46.11	8.82	7.41	1.85	1.96	43.70	58.27	27.97
V_2F_7	45.52	52.83	41.66	40.87	9.00	7.44	1.83	1.85	47.47	63.29	30.38
V_2F_8	47.73	53.57	43.55	43.27	9.57	7.70	1.88	1.90	48.94	65.25	31.32
V_2F_9	49.69	53.71	46.39	45.22	9.70	7.87	2.04	2.06	49.08	65.44	31.41
V_2F_{10}	44.02	54.95	47.34	46.16	10.10	8.01	2.04	2.11	50.55	67.40	32.35
V_2F_{11}	47.69	55.07	46.27	44.20	10.67	8.03	2.11	2.32	50.94	67.92	32.60
V_2F_{12}	53.83	56.18	49.85	47.54	11.14	8.38	2.79	2.81	52.56	70.08	33.64
S.Em±	0.080	0.047	0.102	0.102	0.025	0.010	0.006	0.006	0.082	0.110	0.053
C.D. at 5 %	0.224	0.131	0.288	0.286	0.069	0.029	0.017	0.017	0.231	0.308	0.148

Conclusion

On the basis of two year of experiment it is concluded that the maximum plant height at 90 and 120 DAT, Length of leaf at 90 and 120 DAT, Number of leaves per plant at 90 and 120 DAT, Neck diameters of plant at 90 and 120 DAT, yield-attributing parameters like moisture content %, bulb weight and yield/plot was observed under variety V_2 (Agrifound Dark Red) and in case of fertilizer application all the parameters was found under treatment F_{12} [100% RDF ($N_{120}P_{80}K_{80}$)], in case of combined application of variety and fertilizers treatment combination V_2F_{12} [Agrifound Dark Red + 100% RDF ($N_{120}P_{80}K_{80}$)] was observed better compare to other combinations, while the minimum was observed under the treatments control.

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