SCREENING ONION VARIETIES THROUGH ORGANIC FARMING IN THE SOUTH CHHOTANAGPUR PLATEAU OF JHARKHAND DURING POST-KHARIF SEASON

Sourav Pathak and Avijit Kr. Dutta*

Ramakrishna Mission Vivekananda Educational and Research Institute
School of Agriculture and Rural Development, F/C: IRTDM
Ramakrishna Mission Ashrama, Morabadi, Ranchi-834008, Jharkhand, India

ABSTRACT

After the first green revaluation (1966) in our country, production was increased by using of huge quantity of fertilizer, pesticides, irrigation but thereafter it was realized that by using heavy amount of fertilizer and pesticides, soil health was damaged and even human health was seriously affected. In this backdrop, organic farming has come into existence in 20th century. Organic farming is an eco-friendly and cost minimized farming practices capable to give same yield compare to chemical farming. The present investigationwas conductedduring post *kharif* seasons of 2017 and 2018consideringdifferent organic growing conditions as treatments,*viz. Enriched Sanjeevani*(1%) with straw mulching (T_1), BD-501 (3%) with mulching (T_2), *Sasyagavya* (10%) with mulching (T_3), and inherent fertility status of experimental plot as absolute control (T_4). Seven varieties, namely,V_1 (Sukhsagar); V_2 (Agrifound Dark Red); V_3 (BhimaSweta); V_4 (Bhima Dark Red); V_5 (Nasik Red); V_6 (ArkaNiketan) and V_7 (N-53) were used for the experiment by adopting Factorial Randomized Block Design with their three replications. Several growth, yield and quality attributing characters were studied. Results found to be significant in all the studied characters for growth, yield and quality parameters under different treatments and varietal situations. From the findings, it may be concluded that *Sasyagavya*(10%) is the best for production of onion organically followed by BD-501 (3%) along with vermicompost (10 tha^{-1}), wood ash (5 t ha^{-1}) coupled with mulching with dry paddy straw. Among varieties, Sukhsagar, Agrifound Dark Red, BhimaSweta, Bhima Dark Red and ArkaNiketan are suitable for late *kharif*or early *rabi*season cultivation in the south Chhotanagpur plateau of Jharkhand. Economics study also revealed that *Sasyagavya*and BD-501 are highly suitable for commercial cultivation of onion through organic intervention in the plateau of Jharkhand by employing these varieties of the crop during the post *kharif*season of the region.

Keywords: Onion; *Allium cepa*; Organic Farming; Growth; Yield; Quality, B:C ratio.

INTRODUCTION

Onion (*Allium cepa* L.) is an important vegetable crop whose distinctive flavour is appreciated by people throughout the world. One of the advantages of onion is that the bulbs can be harvested and sold either 'green' in salads, while the mature bulbs are cooked or eaten raw as a vegetable (Ibrahim, 2010). It belongs to the genus *Allium* of the family Alliaceae. The primary centre of origin of onion lies in Central Asia. Onion is preferred for its flavour and pungency which is due to the presence of a volatile sulphur containing compound namely *allyl propyl di sulphide* while the outer skin colour of onion bulb is due to the presence of quercetin (Nadkarni, 1954). Onion has a great nutritional value and it contains 11 amino acids and 100 g of raw onion bulb contains about 501 µgvitamins 'A', 0.03 mg of thiamine, 0.04 mg of riboflavin, 0.02 mg of niacin and 9 mg of ascorbic acid and rest are the carbohydrates which make up the dry matter of the bulb (Watt and Merill, 1950).The bulb of onion is also a rich source of minerals like phosphorus, calcium and protein (Edet*etal.*, 2015).The onion is chosen mainly for its green leaves, unripe and mature bulbs are either eaten raw or cooked as a vegetable. Mild flavoured or colourful bulbs are often chosen for salads. In Jharkhand, Palamau and Ramgarh are main onion growing districts although it can grow successfully in other parts of the state as well. Onion is basically *rabi*seasoncrop but in the South Chhotanagpur Plateau region of the state, it can grow during *kharif*and late *kharif*seasons too. Organic faming in onion revealed that different organic manures have significant role over the growth, yield and proximate quality attributes of onion bulbs (Naik*et al.*, 2013; Bashir *et al.*, 2015; Baraik*et al.*, 2016).

MATERIALS AND METHODOLOGY

The study was conducted at the Organic Experimental Farm of the Faculty Centre for Integrated Rural & Tribal Development and Management of Ramakrishna Mission Vivekananda Educational and Research Institute, Morabadi, Ranchi during two subsequent post *kharif* seasons of 2017 and 2018 to access the effect of different organic liquid formulations [(T_1(Enriched *Sanjeevani* 1% + Straw Mulching); T_3(*Sasyagavya* 10% + Straw Mulching); T_4(inherent fertility statusof experimental plot as absolute control)] over seven varieties [(V_1(Sukhsagar); V_2(Agrifound Dark Red); V_3 (BhimaSweta); V_4 (Bhima Dark Red); V_5 (Nasik Red); V_6 (ArkaNiketan); V_7 (N-53)] in terms of their growth, yield and quality traits expressions. Four treatments (including absolute control) with seven varieties were replicated three times throughFactorial Randomized Block Design in 84 experimental plots each of 3.0 m x 2.0 m sizes by keeping 15 cm inter-row and 10 cm intra-row spacing. Wood ash @ 5 t $ha^{-1}$and vermicompost @ 10 t ha^{-1} was applied to all experimental plots(except in control plots) as basal dose and different organic liquid formulationswere used five times at 15 days interval starting from 15 days after transplanting. Plant height (at harvest), neck diameter, circumference of bulb, bulb weight, harvest index and projected yield were considered for major growth and yield attributes, whereas, TSS, ascorbic acid, total sugar and dry weight of bulb were taken into account for proximate quality traits analyses through standard methods. Data thus obtained were exposed to statistical analyses for their interpretation.

RESULTS AND DISCUSSION

1. Growth, yield and its attributes in onion as influenced by organically designed treatments

Different growth and yield attributes of onion varieties were significantly influenced by the application of different organic manures and liquid organic formulations (Table-1). The plant height of onion (at harvest) in different treatments under organically grown environment recorded significant ($P \leq 0.05$) differences. The tallest height of plant considering average of the seven varieties of onion was observed in treatment T_3 (54.91 cm) followed by T_2 (52.81 cm) and T_1(50.48 cm) and the lowest height (48.01cm) recorded in T_4(Absolute Control). It was observed that the varieties with tallest plant height as recorded in V_2(55.60cm), followed by V_1(54.54 cm), V_5(52.54 cm), V_6(52.16 cm)as against the lowest as recorded in the case of V_7 (46.62 cm). When interaction effect of treatment and varieties was taken into account, then it was shown that V_2 of the treatment T_2as the best with maximum plant height of (61.11cm)while the lowest interaction was documented in T_1V_7 (35.99cm). In the present investigation, neck diameter was recorded significant differences among different treatments as well as different varieties even at ($P \leq 0.05$) probability level (Table-1). The greatest neck diameter was recorded in treatment T_2 (4.60 cm) as contrast to the minimum value as observed in T_4 (3.82 cm) treatment once again. The higher neck diameter was recorded in V_6 (5.13 cm) but the lowest neck diameter as recorded in V_2 (3.90 cm). The interaction effects between treatment and variety recorded non-significant differences ($P \leq 0.05$) with the highest value as recorded in T_2V_6 (5.77 cm) while the lowest value was observed in T_4V_1 and T_4V_3(3.43 cm).The higher magnitude of neck diameter may probably due to higher plant height, number of leaves and leaf area per plant.Circumference of bulb of onion, in the present study, recorded statistically significant ($P \leq 0.05$) differences among various treatments and varieties but their interaction showed non-significant differences.The largest average circumference of onion bulb was observed in treatment T_2 (18.65 cm) while the minimum was revealed in T_4 treatment (12.53 cm). The varieties with greatest circumference of bulb under the influences of four different organic treatments were V_6 (18.58 cm) as against the lowest as recorded in V_7 (17.05 cm).Bulb weight of onion was highly influenced by organic treatmentsas well as varieties (Table-1). Weight of onion bulb recorded highest in T_3 (92.33 g) but the lowest value as documented in T_4 (24.76g). In case of varietal effect it was found that V_6 produce higher weight of bulb (166.62 g) followed by V_1 (64.86 g), V_2 (60.83 g), whereas the light weight bulb produced in V_7 (41.01g). The interaction effect revealed that T_2V_6as the best combination (250.33 g) followed by T_1V_6 (203.76 g), T_3V_6 (182.03g), while the lowest bulb weight as documented in T_4V_7 (17.73 g). The higher magnitude of bulb weight as estimated in the present investigation corroborate well with the earlier finding of Bashir*et al.* (2015).The harvest index of the present investigation was shown statistically significantly differences ($P \leq 0.05$) among different treatments and varieties. When average performances of four organic treatments and their effects over the varieties were taken into account, the highest harvest index (66.95 %) was documented in T_3 treatment followed by T_4 (62.78%) and T_2(58.66%) as contrast to the lowest value as recorded in T_1 treatment (54.50%). Similarly, when varietal performances under the illumination of organically designed treatments were taken into consideration then the maximum

harvest index was recorded in V_1 (66.10 %), followed by V_6 (63.89%), V_2 (63.12%) while the lowest value was observed in V_4(53.66%). Maximum harvest index in onion also revealed with the more dry mass accumulation.The findings on yieldparameter also showed statistically significant ($P \leq 0.05$) differences among varieties and treatment. Among treatments, T_3recorded the highest projectedyield (40.39 t ha^{-1}),but the lowest average yield was record in T_4 (12.47 t ha^{-1}). Among the varieties, V_6(ArkaNiketan) recorded the best variety with projected yield of (36.13 t ha^{-1}) followed by the V_2 (Agrifound Dark Red) with projected yield of 31.87 t ha^{-1}(Table-1). The interaction effect between treatment and variety showed T_2V_6 (47.29 t ha^{-1}) as the best combination while T_4V_7 (8.72 t ha^{-1}) emerged as the worst treatment and varietal combination when yield projection was taken into consideration. The findings on projected yield of the present investigation showed close conformity with the earlier findings of Khan *et al.*(2003); Naik*et al.* (2013); Bashir *et al.*(2015).

2. Proximate quality contributing traits of onion

The findings of the present investigation revealed that different proximate quality attributes of onion bulb are highly influenced by organically designed treatments under different varietal situates (Table-2). Under organically grown condition, the highest amount of TSS was recorded in T_3 treatment (15.94^0Brix), while the lowest value of TSS (12.79^0Brix) was documented in T_1 treatment. Among different varieties it was observed that maximum amount of total soluble solid as recorded in V_6 (15.93^0Brix), on the contrary, the lowest TSS was recorded in V_3(12.48^0Brix). The treatments and varietal interactions also revealed statistically significant differences ($P \leq 0.05$) with the highest(19.73^0Brix) in T_3V_6but T_2V_2combination emerged with the lowest (10.97^0Brix) [Table-2]. The present findings closely matched with the previous finding of Ghosh and Dutta(2016).The results on ascorbic acid content in onion bulbrevealed non-significant differences among varieties as well as treatment and varietal interaction. However, different organically designed treatment showed statistically significant differences ($P \leq 0.05$) among themselves (Table-2). In this context, the highest ascorbic acid was estimated from the sample of T_1 (101.83 mg $100g^{-1}$), butthe lowest was found in T_4 (83.52 mg.$100g^{-1}$).In the present experimental findings, the different treatments showed statistically significant ($P \leq 0.05$) results in case of total sugar content in onion bulb (Table-2).In this context, the maximum value was recorded in T_2 (8.70 %), while the lowest value was observed in T_1 (7.10 %). The dry weight ofbulb showed statistically significant differences ($P \leq 0.05$) among four treatments and seven varieties, although their interactionshowed non-significant differences (Table-2).It was clearly revealed that the higher dry matter in T_2 (15.17%) while the lowest was recorded in T_4 (13.38%). In case of varieties, maximum dry weight was found in V_6 (16.33 %), whereas, the lowest amount of dry weight (12.35%) as recorded in V_2. The interaction effect showed T_2V_6 (18.79%) as the best performer, whereas, T_4V_2 (11.16%) emerged as the worst treatment and variety combination (Table-2). However, the present findings on dry matter content of bulbs well matched with the earlier findings of Malkki and Nikkila (1978); Gopalan*et al.*(1983); Abdel *et al.*(2006).

3. Economics of organic onion cultivation

The findings highlighted that total cost of cultivation in one hectare of land as recorded here as Rs.73500.00(for T_1), Rs. 72000.00 (for T_2), Rs. 75000.00 (for T_3) and Rs.60000.00 (for T_4)[Table-3].The variation in total cost of cultivation is mainly due to level of organic inputs used in organically designed treatments.When benefit: cost ratio was taken into account, T_3(*Sasyagavya*10% + Paddy Straw Mulching) emerged as the best treatment followed by T_2 (*BD-501* 3% + Paddy Straw Mulching), T_1*(Enriched Sanjeevani*1%+ Paddy Straw Mulching) but the lowest values documented in T_4 (Absolute Control) under different varietal conditions [Table-3]. In this particular context, when treatment and variety interaction effect was considered then T_1V_6 (3.81) emerged as the best followed by T_1V_2 (3.44) while the lowest value as detected in T_1V_4 (1.02). Similarly, in the cases of T_2, it was found that T_2V_6 (4.60) as the best followed by T_2V_2 (3.80) as against the lowest of 2.10 as recorded in T_2V_7 (Table-3).In T_3 treatment, T_3V_4 (4.28) was emerged as the best followed by the T_3V_3 (4.02) as contrast to the T_3V_7 (3.00) as the poorest combination. When T_4 was taken into concern, T_4V_6 (1.81) materialized as the best followed by T_4V_2 (1.61), while the lowest B:C ratio was documented in T_4V_7 (1.02) [Table-3]. The B: C ratio as documented in organically grown onion in the present investigation well matched with the previous findings of Nandeshwar*et al.* (2014).

CONCLUSION

It may be concluded that *Sasyagavya*(10%) is the best for production of onion organically followed by BD-501 (3%) along with vermicompost (10 t ha^{-1}), wood ash (5 t ha^{-1}) coupled with mulching with dry paddy straw. Among the varieties, Agrifound Dark Red, BhimaSweta, Bhima Dark Red, Sukhsagar, and ArkaNiketan are suitable for post*kharif*or early *rabi*season cultivation in the south Chhotanagpur plateau of Jharkhand. Economics study also revealed that *Sasyagavya*and BD-501 are highly suitable organic inputs for commercial cultivation of onion through organic intervention in plateau regions of Jharkhand by employing these varieties of the crop during post *kharif*season of the region.

REFERENCES

Abdel, C. G. and Al-Juboori, A. A. (2006).Response of Three Onion (*Alliumcepa*L.)Cultivars Grown Under Irrigated and Non-Irrigated Cultivation to Polyethylene Mulching 2- Production of Dry Onion Bulbs in Fall Season.*Mesopotamia Journal of Agriculture*,**34**(2): 23-32.

Acharya, U.; Rimal, N. S.; Venkatesan1, K.; Saraswathi, T.; and Subramanian, K.S.(2015). Response on growth, yield and quality parameters of Multiplier Onion (*Alliumcepa* L. var. *aggregatumDon*.) var. Co-5 with different doses and method of Zinc and Boron application.*International Journal of Research*, **2**(1): 757-765.

Baraik, S. K.; Nag, D.; Sengupta, A. and Dutta, A. K. (2016).Performance of Onion as Influenced by Traditional, Integrated and Organic Management Approaches.*International Journal of Agriculture Sciences*, **8**(23): 1467-1469.

Bashir, A. Y.; Liman, Y. M. and Zangoma, I. M. (2015).Effect of Different Source of Organic Manure on the Growth and Yield of Irrigated Onion in Damaturu Local Government Area of Yobe State, Nigeria.*International Journal of Multidisciplinary Academic Research*, **3**(4): 23-29.

Colina-Coca, C., de Ancos, B. and Sánchez-Moreno, C.(2014).Nutritional composition of processed onion: S-Alk (en) yl-L-cysteine sulfoxides, organic acids, sugars, minerals, and vitamin C.*Food Bioprocess Technology*,**7**(1): 289-298.

Edet, A.; Eseyin, O.; Aniebiet, E. (2015).Anti-nutrients composition and mineral analysis of allium cepa (onion) bulbs.*African Journal of Pharmacy and Pharmacology*,**9**(13): 456-459.

Ghosh, S. and Dutta, A. K. (2016).Screening Onion (*Alliumcepa*) Varieties for Growth and Quality Attributes through Different Organic Management Conditions during late *kharif*season of Jharkhand. Unpublished M. Sc. Thesis Submitted to the Ramakrishna Mission Vivekananda University, F/C: Integrated Rural and Tribal Development & Management, Ranchi, Jharkhand.

Gopalan, C.; Ramasastri, B. V. and Balasubramanium, S. C. (1983). Nutritive value of Indian foods.*National Institute of Nutrition*, Indian Council of Agricultural Research, New Delhi.

Ibrahim, N. D. (2010). Growth and Yield of Onion (*Alliumcepa*L.) in Sokoto, Nigeria.*Agriculture and biology journal of North America*,**1**(4): 556-564.

Khan, M. A.; Hassan, M. K.; Miah, M. A. J.; Alam, M. M. and Masum, A. S. M. H. (2003).Effect of Plant Spacing on the Growth and Yield of Different Varieties of Onion.*Pakistan Journal of Biological Sciences*, **6**(18): 1582-1585.

Malkki, Y. and Nikkila (1978).The composition and aroma of onion and influencing factors.*Vegetable Journal of Agricultural Society*, **50**(2): 103-104.

Nadkarni, K. N. (1954). *Allium cepa*L.and*Allium sativum*L., The Indian MateriaMedica, 3rdEd. (Part-1).Popular Book Depot, Bombay, p.63.

Naik, H. M.; Srihari, G. and GopalaRao, B. (2013).Organic production of onion.*Crop Research*, **45** (1, 2 & 3): 218-220.

Nandeshwar, V.N.; Mastiholi, A.B. and Kerutagi, M.G. (2014). Economics of onion (*Allium cepa*L.) production under organic condition.*International Research Journal of Agricultural Economics and Statistics*, **5**(1): 35-38.

Watt, B. K. and Merrill, A. L. (1950). Composition of foods, raw processed, prepared. *Agriculture Handbook*, Department of Agriculture, United States, **8**:147.

Table-1: Growth, yield and its attributes of different onion varieties as influenced by organically designed treatments.

Treatment(T)	Plant height (cm)	Neck diameter (cm)	Circumference of bulb (cm)	Bulb weight (g)	Harvest index %	Yield (Projected) (t ha^{-1})
T_1	50.68^{bc}	4.20^{ab}	17.00^{b}	71.62	54.50^{c}	27.61c
T_2	52.81^{ab}	4.60^{a}	18.65^{a}	88.64	58.66^{bc}	33.46b
T_3	54.91^{a}	4.57^{a}	18.46^{a}	92.33	66.95^{a}	40.39a
T_4	48.01^{c}	3.82^{b}	12.53^{c}	24.76	62.78^{ab}	12.47d
SEm (±)	1.18	0.17	0.33	2.56	1.99	0.85
CD $_{P\leq0.05}$	3.34	0.48	0.93	7.27	5.66	2.42
Variety (V)						
V_1	54.54^{a}	3.92^{b}	17.44^{bc}	64.86	66.10^{a}	30.33bc
V_2	55.60^{a}	3.90^{b}	18.49^{a}	60.83	63.12^{ab}	31.87b
V_3	51.53^{ab}	4.33^{b}	17.82^{ab}	55.40	59.06^{abc}	29.90bc
V_4	48.22^{bc}	4.08^{b}	16.72^{c}	46.72	53.66^{c}	24.03d
V_5	52.54^{ab}	4.21^{b}	17.95^{a}	49.91	62.16^{ab}	27.20cd
V_6	52.16^{ab}	5.13^{a}	18.58^{a}	166.62	63.89^{ab}	36.13a
V_7	46.62^{c}	4.51^{ab}	17.05^{bc}	41.01	57.07^{bc}	19.92e
SEm (±)	1.56	0.22	0.44	3.39	2.64	1.13
CD $_{P\leq0.05}$	4.41	0.64	0.87	9.62	7.48	3.20
Interaction(T x V)						
T_1V_1	52.01	3.97	15.45	65.93	60.55	28.52
T_1V_2	61.11	3.80	18.76	59.99	49.57	36.12
T_1V_3	51.24	4.37	17.15	58.71	49.06	30.82
T_1V_4	40.44	3.80	15.03	27.60	43.48	10.70
T_1V_5	59.21	4.13	17.50	49.74	59.12	29.19
T_1V_6	54.72	5.37	18.92	203.76	69.47	40.80
T_1V_7	35.99	3.93	16.21	35.60	50.22	17.12
T_2V_1	58.52	4.23	17.69	78.46	71.63	37.85
T_2V_2	54.54	4.13	19.06	75.69	71.17	39.06
T_2V_3	53.59	4.87	18.61	60.28	46.46	34.37
T_2V_4	49.30	4.23	16.75	47.86	42.02	26.44
T_2V_5	48.75	4.50	18.40	55.99	51.17	27.56
T_2V_6	54.98	5.77	21.19	250.33	67.21	47.29
T_2V_7	49.99	4.50	18.83	51.90	60.96	21.64
T_3V_1	57.19	4.03	20.01	89.10	67.25	42.35
T_3V_2	56.18	4.13	19.06	78.61	68.05	38.53
T_3V_3	52.39	4.67	18.46	81.83	77.46	43.04
T_3V_4	57.98	4.60	19.21	84.66	72.53	45.81
T_3V_5	53.16	4.47	18.62	71.25	71.56	39.92
T_3V_6	49.93	4.57	16.79	182.03	53.53	40.93
T_3V_7	57.54	5.50	17.10	58.81	58.28	32.19
T_4V_1	50.42	3.43	16.59	25.98	64.98	12.59
T_4V_2	50.57	3.53	17.10	29.02	63.71	13.76
T_4V_3	48.90	3.43	17.08	20.79	63.25	11.36
T_4V_4	45.14	3.67	15.89	26.78	56.61	13.18
T_4V_5	49.06	3.73	17.27	22.67	66.78	12.15
T_4V_6	49.02	4.83	17.42	30.33	65.37	15.50
T_4V_7	42.94	4.10	16.05	17.73	58.80	8.72
SEm (±)	3.11	0.45	0.87	6.78	5.28	2.26
CD $_{P\leq0.05}$	8.83	NS	NS	19.25	14.97	6.40

Note: NS- Non Significant; V_1(Sukhsagar); V_2(Agrifound Dark Red); V_3 (BhimaSweta); V_4 (Bhima Dark Red); V_5 (Nasik Red); V_6 (ArkaNiketan); V_7 (N-53); T_1(Enriched *Sanjeevani* 1%+ Paddy Straw Mulching) T_2 (BD-501 3% + Paddy Straw Mulching); T_3(*Sasyagavya* 10% + Paddy Straw Mulching); T_4(Absolute Control: without application of any vermicompost, wood ash, organic liquid manures and without mulching).

Table-2: Proximate quality attributes of different onion varieties as influenced by organically designed treatments.

Treatment(s)	TSS (^{0}Brix)	Ascorbic Acid (mg 100g^{-1})	Total sugar (%)	Dry weight of bulb (%)
T_1	12.79^{d}	101.83^{a}	7.10^{d}	14.82^{a}
T_2	13.75^{bc}	98.17^{a}	8.70^{a}	15.17^{a}
T_3	15.94^{a}	95.24^{a}	7.14^{c}	14.59^{a}
T_4	14.26^{b}	83.52^{b}	7.80^{b}	13.38^{b}
SEm (±)	0.56	3.63	0.15	0.40
CD $_{P\leq0.05}$	1.58	10.30	0.43	1.15
Varieties				
V_1	14.79^{a}	85.90	7.99^{a}	15.73^{ab}
V_2	13.85^{abc}	96.15	6.85b^{a}	12.35^{d}
V_3	12.48^{c}	102.56	7.65^{a}	14.01^{c}
V_4	12.68^{bc}	87.18	8.19^{a}	14.07^{c}
V_5	14.96^{a}	92.31	7.94^{a}	14.21^{bc}
V_6	15.93^{a}	100.00	8.22^{a}	16.33^{a}
V_7	14.62^{ab}	98.72	6.97^{b}	14.75^{bc}
SEm (±)	0.74	4.80	0.20	0.54
CD $_{P\leq0.05}$	2.09	NS	0.57	1.52
Interaction(V x T)				
T_1V_1	11.20	76.92	8.45	16.12
T_1V_2	11.70	97.44	6.56	14.36
T_1V_3	11.27	107.69	6.76	13.32
T_1V_4	11.60	107.69	7.59	13.44
T_1V_5	15.73	97.44	6.84	14.86
T_1V_6	14.90	117.95	6.74	17.07
T_1V_7	13.13	107.69	6.74	14.58
T_2V_1	13.90	92.31	8.57	16.14
T_2V_2	10.97	102.56	7.17	11.69
T_2V_3	13.20	117.95	8.71	15.26
T_2V_4	13.00	87.18	9.24	14.59
T_2V_5	13.53	97.44	9.39	14.94
T_2V_6	16.90	87.18	10.28	18.79
T_2V_7	14.73	102.56	7.56	14.81
T_3V_1	19.07	97.44	6.75	15.66
T_3V_2	13.47	97.44	6.59	12.20
T_3V_3	13.33	97.44	7.24	14.55
T_3V_4	13.53	76.92	7.41	14.06
T_3V_5	15.73	97.44	7.50	14.00
T_3V_6	19.73	102.56	8.11	16.27
T_3V_7	16.70	97.44	6.39	15.41
T_4V_1	15.00	76.92	8.18	15.01
T_4V_2	19.27	87.18	7.09	11.16
T_4V_3	12.10	87.18	7.88	12.88
T_4V_4	12.57	76.92	8.52	14.18
T_4V_5	14.83	76.92	8.03	13.03
T_4V_6	12.17	92.31	7.74	13.19
T_4V_7	13.90	87.18	7.19	14.22
SEm (±)	1.47	9.60	0.40	1.07
CD $_{P\leq0.05}$	4.18	NS	1.14	NS

Note: NS- Non Significant; V_1(Sukhsagar); V_2(Agrifound Dark Red); V_3 (BhimaSweta); V_4 (Bhima Dark Red); V_5 (Nasik Red); V_6 (ArkaNiketan); V_7 (N-53); T_1(Enriched *Sanjeevani* 1%+ Paddy Straw Mulching) T_2 (BD-501 3% + Paddy Straw Mulching); T_3(*Sasyagavya* 10% + Paddy Straw Mulching); T_4(Absolute Control: without application of any vermicompost, wood ash, organic liquid manures and without mulching).

Table-3: Economics of onion cultivation in one hectare of land through different organically designed treatments

Components	*Growing Condition: T_1(Enriched Sanjeevani 1%+ Paddy Straw Mulching)*						
	T_1V_1	**T_1V_2**	**T_1V_3**	**T_1V_4**	**T_1V_5**	**T_1V_6**	**T_1V_7**
Total cost of cultivation (Rs.) (A_1)	73500.00	73500.00	73500.00	73500.00	73500.00	73500.00	73500.00
Projected yield (t ha^{-1})	28.53	36.12	30.82	10.70	29.19	40.00	17.12
Selling price (Rs. kg^{-1})	7.00	7.00	7.00	7.00	7.00	7.00	7.00
Total income (Rs. ha^{-1}) (B_1)	199710.00	252840.00	215740.00	74900.00	204330.00	280000.00	119840.00
Net profit (Rs. ha^{-1})	126210.00	179340.00	142240.00	1400.00	130830.00	206500.00	46340.00
B:C Ratio (B_1/A_1)	**2.72**	**3.44**	**2.94**	**1.02**	**2.78**	**3.81**	**1.63**
Components	*Growing Condition: T_2 (BD-501 3% + Paddy Straw Mulching)*						
	T_2V_1	**T_2V_2**	**T_2V_3**	**T_2V_4**	**T_2V_5**	**T_2V_6**	**T_2V_7**
Total cost of cultivation (Rs.) (A_1)	72000.00	72000.00	72000.00	72000.00	72000.00	72000.00	72000.00
Projected yield (t ha^{-1})	37.85	39.07	34.37	26.44	27.56	47.29	21.64
Selling price (Rs. kg^{-1})	7.00	7.00	7.00	7.00	7.00	7.00	7.00
Total income (Rs. ha^{-1}) (B_1)	264950.00	273490.00	240590.00	185080.00	192920.00	331030.00	151480.00
Net profit (Rs. ha^{-1})	192950.00	201490.00	168590.00	113080.00	120920.00	259030.00	79480.00
B:C Ratio (B_1/A_1)	**3.68**	**3.80**	**3.34**	**2.57**	**2.68**	**4.60**	**2.10**
Components	*Growing Condition: T_3 (Sasyagavya 10% + Paddy Straw Mulching)*						
	T_3V_1	**T_3V_2**	**T_3V_3**	**T_3V_4**	**T_3V_5**	**T_3V_6**	**T_3V_7**
Total cost of cultivation (Rs.) (A_1)	75000.00	75000.00	75000.00	75000.00	75000.00	75000.00	75000.00
Projected yield (t ha^{-1})	42.35	38.53	43.04	45.81	39.92	40.93	32.19
Selling price (Rs. kg^{-1})	7.00	7.00	7.00	7.00	7.00	7.00	7.00
Total income (Rs. ha^{-1}) (B_1)	296450.00	269710.00	301280.00	320670.00	279440.00	286510.00	225330.00
Net profit (Rs. ha^{-1})	221450.00	194710.00	226280.00	245670.00	204440.00	211510.00	150330.00
B:C Ratio (B_1/A_1)	**3.95**	**3.60**	**4.02**	**4.28**	**3.73**	**3.82**	**3.00**
Components	*Growing Condition: T_4 (Absolute Control)*						
	T_4V_1	**T_4V_2**	**T_4V_3**	**T_4V_4**	**T_4V_5**	**T_4V_6**	**T_4V_7**
Total cost of cultivation (Rs.) (A_1)	60000.00	60000.00	60000.00	60000.00	60000.00	60000.00	60000.00
Projected yield (t ha^{-1})	12.59	13.76	11.36	13.18	12.15	15.50	8.72
Selling price (Rs. kg^{-1})	7.00	7.00	7.00	7.00	7.00	7.00	7.00
Total income (Rs. ha^{-1}) (B_1)	88130.00	96320.00	79520.00	92260.00	85050.00	108500.00	61040.00
Net profit (Rs. ha^{-1})	28130.00	36320.00	19520.00	32260.00	25050.00	48500.00	1040.00
B:C Ratio (B_1/A_1)	**1.47**	**1.61**	**1.33**	**1.54**	**1.42**	**1.81**	**1.02**