Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
www.phytojournal.com
JPP 2021; 10(1): 2483-2486
Received: 19-10-2020
Accepted: 21-12-2020

Santosh Kumar Maida
Research Scholar (Horticulture), Mahatma Gandhi Chitrakoot Gramodaya Vishwa Vidyalaya, Chitrakoot, District Satna, Madhya Pradesh, India

Dr. SS Singh
Assistant Professor, Mahatma Gandhi Chitrakoot Gramodaya Vishwa Vidyalaya, Chitrakoot, District Satna, Madhya Pradesh, India

Mahendra Jadia
Research Scholar (Horticulture), Mahatma Gandhi Chitrakoot Gramodaya Vishwa Vidyalaya, Chitrakoot, District Satna, Madhya Pradesh, India

Krapal Singh Verma
Research Scholar (Horticulture), Mahatma Gandhi Chitrakoot Gramodaya Vishwa Vidyalaya, Chitrakoot, District Satna, Madhya Pradesh, India

Corresponding Author:
Santosh Kumar Maida
Research Scholar (Horticulture), Mahatma Gandhi Chitrakoot Gramodaya Vishwa Vidyalaya, Chitrakoot, District Satna, Madhya Pradesh, India

Effect of different integrated approaches of organic and inorganic fertilization on quality of onion (*Allium cepa* L.)

Santosh Kumar Maida, Dr. SS Singh, Mahendra Jadia and Krapal Singh Verma

Abstract
The experiment was carried out to find out the effect of organic, inorganic sources of nutrients on growth of Garlic. The treatment combinations involving three levels of organic manure i.e. O_1- FYM (farm yard manure@20.t/ha, O_2- Vermicompost@10.t/ha, O_3- Poultry manure@05.t/ha, three levels of In-organic fertilizer i.e. I_1- Control, I_2- 100% RDF (NPK-150:80:60), I_3- 50% RDF (NPK-75:40:30) and Bio-enhancers in three levels i.e. B_1- Panchgavya (45 and 60 DAT), B_2- Jivamrit-500 lit. /ha (with every irrigation), B_3- Bijamrit- seed treatment + seedling treatment Practices were given in Agrifound Dark Red variety. neck thickness of bulb (cm), total soluble solids content in bulb (%), vitamin-C (Ascorbic acid), allyl-propyl disulphide ($C_6H_{12}S_2$). were observed by the maximum at 1st year, 2nd year and Pooled were observed under the treatment I_2 (100% RDF (NPK-150:80:60) at all the growth stages.

Keywords: FYM, treatment, plant, stages

Introduction
There are many bulb crops grown around the world among which one of the most important bulb crop is Onion. Onion (*Allium cepa* L., 2n = 16) is from the Amaryllidaceae family and it was originated in the central part of the Asian continent.

It is an essential part of almost all the kitchens in the Indian subcontinent. Onion is used in most of the curries prepared in India. It is used in salad, spices, sauces, vegetables etc. In our country it is cultivated as annual crop for the production of Onion bulbs and biennial crop for the production of seeds.

Onion bulb has flesh with concentric scales enclosed in wrapping just like various leaves are wrapped one over the other. These scales are connected to the base through stem disc. The outermost layer has roots in it which is connected to the stem providing nutrients from the soil through various layers to the stem. In general terms it can be said that the bulb is basically the stem.

In India mostly red and pungent type onions are preferred, whose outer skin is perfectly dried having a lusture and dried top. In other places like Europe and America, yellow and brown coloured bulbs are used.

As far as historical perspective of the cultivation of Onion is considered, it traces back 5000 years. Onion is domesticated in Afghanistan, Pakistan, Tajakistan, Uzbekistan i.e. North-West part of the Asian region. Onion is also considered to be originated in the Mediterranean region. Onion has thrombolytic, hypo-cholesterolemic and antioxidant effects therefore it is used as cardiovascular and anticancer agent also.

Onion is used in cure of sores, ulcers, bronchitis, bleeding nose and treatment of Warts. Fresh onion juice can induce sleep, constipation is relived and improves respiration.

Onion juice is digestive in nature, it is anti-diabetic, anti- fermentative, it is used in fever, bronchitis, dropsy, applied to burns, applied to warts etc. Onion juice has anti coagulant properties therefore it is used in curing bleeding nose.

As far as chemical composition of Onion is concerned moisture is the biggest constituent which is about 86.60g, protein (0.92 g), fat (0.08 g), carbohydrate (10.11g), fibre (1.40 g), sugar (4.28 g), calcium (22 mg), iron (0.19 mg,) magnesium (10 mg), phosphorus (27 mg), potassium (144 mg), sodium (3 mg) , zinc (0.16 mg), copper (0.04 mg), manganese (0.13 mg), selenium (0.50 mg), vitamin-C (6.40 mg), thiamin (0.05 mg), riboflavin (0.03 mg), niacin (0.08 mg), Vitamin-B6 (0.15 mg), folate-total (19 µcg), Vitamin-A (2 IU), Vitamin-E (0.02 mg), Vitamin-K (0.40 µcg), fat-saturated (0.03 g), fat monounsaturated (0.02 g), fat polyunsaturated (0.06 g)

The pungent odour in onion is because of sulphur compounds in the form of volatile oil. This sulphur compound is Allyl-Propyl Disulphide ($C_6H_{12}S_2$). The pungent odour in onion depends on the growing conditions, maturity stage and the conditions in which it is stored.

Quercetin is the cause of the colour on the outer skin of the onion. Catechol produces anti-fungal properties in the onion.

The major onion growing nations are India, China, USA, Turkey, Russia, Iran, Mexico, Brazil, Korea and Spain. In India, the onion is grown majorly in Maharashtra, Madhya Pradesh, Gujarat, Karnataka, Tamil Nadu, Orissa, Uttar Pradesh, Andhra Pradesh, Bihar and Punjab.

In our country mostly farmers use inorganic fertilizers for quick supply of nutrients to the plants. This has pushed up the agriculture production but it involved a heavy price on inputs to achieve production targets. Chemical fertilizers have ill-effects such as leaching out, water pollution, destroying micro-organisms and friendly insects, making the crop more susceptible to the attack of diseases, reducing the soil fertility and thus causing irreparable damage to the overall system.

Organic fertilizers can also be used for the production of Onion. Natural fertilizers like Farm Yard Manure (FYM), compost and poultry manure are the most commonly used in agriculture. FYM is the extensively used inorganic source of plant nutrient. Poultry manure in the richest source of plant nutrients followed by bio-gas slurry, composts, goat manure and FYM, besides vermin-compost which is rich in nutrients, organic matter, vitamins, microbes and growth promoters. The addition of manures in combination with fertilizers may be helpful to maintain the organic carbon content in soil. Use of chemical fertilizers alone cannot keep the pace with the present time in maintenance of soil health for sustaining the productivity.

Use of Bio-enhancers is a new concept in organic agriculture. The bio enhancers are in common use are *Amrit Pani, Bijamrita, Jiwamrita, Panchgavaya, Vermi wash etc*. In fact, these are rich source of microbial consortia, macro and micronutrients and plant growth promoting substances including immunity enhancers.

Material and Method

A field experiment on Effect of different integrated approaches of organic and inorganic fertilization on growth of onion (*Allium cepa* L.*)* was carried out during Kharif season 2016 and 2017 at Mahatma Gandhi Chitrakoot Gramodaya Vishwa Vidyalaya, Chitrakoot, District Satna (M.P.). The research work was conducted in the Factorial Completely Randomized Block Design with three replications. Each replication was comprised of 27 treatment combinations. The treatment combinations involving three levels of organic manure i.e. O_1- FYM (farm yard manure@20.t/ha, O_2- Vermicompost@10.t/ha, O_3- Poultry manure@05.t/ha, three levels of In-organic fertilizer i.e. I_1- Control, I_2- 100% RDF (NPK-150:80:60), I_3- 50% RDF (NPK-75:40:30) and Bio-enhancers in three levels i.e. B_1- Panchgavya (45 and 60 DAT), B_2- Jivamrit-500 lit. /ha (with every irrigation), B_3- Bijamrit- seed treatment + seedling treatment were given in Agrifound Dark Red variety. The climate of the region is semi-arid and sub-tropical having extreme winter and summer. During the winter months, the temperature drops down to as low as 2°C while in the summer months the temperature extend above 47°C, hot desiccating winds (Loo) are regular symptom during summers while, there may be infrequent spell of frost during the winter months. The soil of the investigation field was clay loam with good drainage and uniform texture with medium NPK status. Observations were recorded according to standard procedure on neck thickness of bulb (cm), total soluble solids content in bulb (%), vitamin-C (Ascorbic acid), allyl-propyl disulphide ($C_6H_{12}S_2$).

Result & Discussion

Among growth parameters neck thickness of bulb (cm), total soluble solids content in bulb (%), vitamin-C (ascorbic acid) and allyl-propyl disulphide ($C_6H_{12}S_2$) were studies in onion.

Significantly maximum neck thickness of bulb were observed under the treatment O_2 (Vermicompost@10.t/ha), while the minimum neck thickness of bulb was observed under the treatment O_3 (Poultry manure@05.t/ha) during 2016-17, 2017-18 and pooled, respectively. The beneficial effect of Vermicompost on yield attributes might be attributed to its ability of sustains availability of nutrient throughout the growing season. The enhanced balanced C: N ratio might have enhanced the synthesis of carbohydrates with finally increased in neck thickness. These results were in close conformity with the findings of Banjare *et al.* 2015 [2], Manna D 2013 and Patidar *et al.* 2019 [9].

In case of inorganic fertilizer maximum neck thickness of bulb was recorded in I_2 (100% RDF (NPK-150:80:60)), while minimum neck thickness of bulb was recorded in I_1(Control) during 2016-17, 2017-18 and pooled, respectively. The appropriate use of major nutrients supports the metabolic and auxin activities in plant and ultimately resulted in boosting neck thickness. These findings are similar of those Banjare *et al.* 2015 [2], Manna D 2013.

As regards to bio-enhancers, maximum neck thickness of bulb was recorded under B_2 (Jivamrit-500 lit. /ha with every irrigation), while minimum neck thickness of bulb was recorded under B_3 (Bijamrit- seed treatment + seedling treatment) during 2016-17, 2017-18 and pooled, respectively. In Jivamrit, Effective Micro Organisms (EMO) were the mixed culture of naturally occurring, beneficial microbes that improved the neck thickness of bulb. These findings are similar of those Chadha *et al.* 2020a [3], Chadha *et al.* 2020b [4], Pathak and Ram 2013 [8], Kumar *et al.* 2018 [7].

Interaction effect of the different factors was found to significant except the interaction of OxI, IxB, BxO and OxIxB during 2017-18 and pooled which was non-significant.

Significantly maximum total soluble solids content in bulb were observed under the treatment O_2 (Vermicompost@10.t/ha), while the minimum total soluble solids content in bulb was observed under the treatment O_3 (Poultry manure@05.t/ha) during 2016-17, 2017-18 and pooled, respectively. Application of vermicompost might have the ability to increase the availability of other nutrients like nitrogen, phosphorus and potassium probably due to higher rate of mineralization and favorable condition for microbial and chemical activity, which in turn increased the total soluble solids content in bulb. Another reason might be the increased activity of nitrate reductive enzymes which helped in synthesis of certain amino acids and protein as reported by Banjare *et al.* 2015 [2].

In case of inorganic fertilizer maximum total soluble solids content in bulb was recorded in I_2 (100% RDF (NPK-150:80:60)), while minimum total soluble solids content in bulb was recorded in I_1(Control) during 2016-17, 2017-18 and pooled, respectively. The accumulation of higher total soluble solids content in bulb might be correlated with the increased activity of nitrate reductase which helped in synthesis of certain amino acids and proteins. These results

are also corroborated by the findings of Banjare *et al.* 2015 [2],Ganie and Solanki *et al.* 2010 [6].

As regards to bio-enhancers, maximum total soluble solids content in bulb was recorded under B_2 (Jivamrit-500 lit. /ha with every irrigation), while minimum total soluble solids content in bulb was recorded under B_3 (Bijamrit- seed treatment + seedling treatment) during 2016-17, 2017-18 and pooled, respectively. Jivamrit combination is adjudged as the best organic nutrition practice for sustainability by its overall performance on growth, productivity, quality of crops. These results were in close conformity with the findings of Chadha *et al.* 2020a [3], Chadha *et al.* 2020b [4], Pathak and Ram 2013 [8], Kumar *et al.* 2018 [7].

Interaction effect of the different factors was found to significant except the interaction of OxI, IxB, BxO and OxIxB during 2017-18 and IxB, BxO and OxIxB pooled which was non-significant.

Significantly maximum vitamin-C (Ascorbic acid) were observed under the treatment O_2 (Vermicompost@10.t/ha), while the minimum vitamin-C (Ascorbic acid) was observed under the treatment O_3 (Poultry manure@05.t/ha) during 2016-17, 2017-18 and pooled, respectively. Application of vermicompost might have the ability to increase the availability of other nutrients like nitrogen, phosphorus and potassium probably due to higher rate of mineralization and favorable condition for microbial and chemical activity, which in turn increased vitamin-C (Ascorbic acid). Manna D 2013.

In case of inorganic fertilizer maximum vitamin-C (Ascorbic acid) was recorded in I_2 (100% RDF (NPK-150:80:60)), while minimum vitamin-C (Ascorbic acid) was recorded in I_1(Control) during 2016-17, 2017-18 and pooled, respectively. The accumulation of higher vitamin-C (Ascorbic acid) content in bulb might be correlated with the increased activity of nitrate reductase which helped in synthesis of certain amino acids and proteins. These results are also corroborated by the findings of Biesiada and Kolota 2009.

As regards to bio-enhancers, maximum vitamin-C (Ascorbic acid) was recorded under B_2 (Jivamrit-500 lit. /ha with every irrigation), while minimum vitamin-C (Ascorbic acid) was recorded under B_3 (Bijamrit- seed treatment + seedling treatment) during 2016-17, 2017-18 and pooled, respectively. Jivamrit combination is adjudged as the best organic nutrition practice for sustainability by its overall performance on growth, productivity, quality of crops. These results were in close conformity with the findings of Chadha *et al.* 2020a [3], Chadha *et al.* 2020b [4], Pathak and Ram 2013 [8], Kumar *et al.* 2018 [7].

Interaction effect of the different factors was found to significant except the interaction of OxI, IxB, BxO and OxIxB during 2017-18 which was non-significant.

Significantly maximum allyl-propyl disulphide were observed under the treatment O_2 (Vermicompost@10.t/ha), while the minimum allyl-propyl disulphide was observed under the treatment O_3 (Poultry manure@05.t/ha) during 2016-17, 2017-18 and pooled, respectively. Application of vermicompost might have the ability to increase the availability of other nutrients like nitrogen, phosphorus and potassium probably due to higher rate of mineralization and favorable condition for microbial and chemical activity, which in turn increased the N, P, K and allyl-propyl disulphide. Manna D 2013.

In case of inorganic fertilizer maximum allyl-propyl disulphide was recorded in I_2 (100% RDF (NPK-150:80:60)), while minimum allyl-propyl disulphide was recorded in I_1(Control) during 2016-17, 2017-18 and pooled, respectively. The accumulation of higher allyl-propyl disulphide content in bulb might be correlated with the increased activity of nitrate reductase which helped in synthesis of certain amino acids and proteins. These results are also corroborated by the findings of Ganie and Solanki *et al.* 2010 [6].

As regards to bio-enhancers, maximum allyl-propyl disulphide was recorded under B_2 (Jivamrit-500 lit. /ha with every irrigation), while minimum allyl-propyl disulphide was recorded under B_3 (Bijamrit- seed treatment + seedling treatment) during 2016-17, 2017-18 and pooled, respectively. Jivamrit combination is adjudged as the best organic nutrition practice for sustainability by its overall performance on growth, productivity, quality of crops. These results were in close conformity with the findings of Chadha *et al.* 2020a [3], Chadha *et al.* 2020b [4], Pathak and Ram 2013 [8], Kumar *et al.* 2018 [7].

Interaction effect of the different factors was found to significant except the interaction of OxI, IxB, BxO and OxIxB during 2017-18 which was non-significant.

Table 1: Effect of different integrated approaches of organic and inorganic fertilization on different quality parameters of onion

Treatment Symbols	Neck thickness of bulb (cm)			Total soluble solids content in bulb (%)			Vitamin-C (Ascorbic acid)			Allyl-propyl disulphide ($C_6H_{12}S_2$)		
	1st year	2nd year	Pooled	1st year	2nd year	Pooled	1st year	2nd year	Pooled	1st year	2nd year	Pooled
O_1	1.219	1.533	1.376	20.543	21.133	20.8	11.689	12.066	11.877	0.088	0.098	0.093
O_2	1.269	1.667	1.468	20.653	21.309	20.985	11.83	12.284	12.057	0.092	0.103	0.098
O_3	1.044	1.186	1.115	20.002	20.457	20.231	11.044	11.25	11.147	0.073	0.077	0.075
SEm ±	0	0.071	0.036	0.001	0.058	0.03	0.004	0.071	0.037	0	0.002	0.001
CD 5%	0	0.202	0.101	0.002	0.164	0.085	0.012	0.202	0.105	0	0.005	0.002
I_1	1.017	1.142	1.079	19.943	20.386	20.166	10.911	11.1	11.006	0.07	0.073	0.072
I_2	1.347	1.831	1.589	20.856	21.578	21.222	12.052	12.592	12.322	0.096	0.109	0.103
I_3	1.169	1.413	1.291	20.399	20.935	20.669	11.6	11.907	11.754	0.087	0.096	0.091
SEm ±	0	0.071	0.036	0.001	0.058	0.03	0.004	0.071	0.037	0	0.002	0.001
CD 5%	0	0.202	0.101	0.002	0.164	0.085	0.012	0.202	0.105	0	0.005	0.002
B_1	1.184	1.464	1.324	20.393	20.956	20.677	11.511	11.854	11.683	0.084	0.092	0.088
B_2	1.231	1.584	1.408	20.55	21.17	20.863	11.685	12.094	11.89	0.089	0.099	0.094
B_3	1.117	1.338	1.227	20.255	20.773	20.516	11.367	11.651	11.509	0.08	0.087	0.084
SEm ±	0	0.071	0.036	0.001	0.058	0.03	0.004	0.071	0.037	0	0.002	0.001
CD 5%	0	0.202	0.101	0.002	0.164	0.085	0.012	0.202	0.105	0	0.005	0.002

References

1. Biesiada A, Kolota E. The effect of nitrogen fertilization on yield and nutritional value of onion grown from sets for early cropping. Vegetable Crops Research Bulletin 2009;70:145-151.
2. Banjare Chetna, Shukla Neeraj, Sharma Pravin Kumar, Patanwar Mridubhashini, Deepika Chandravanshi. Effect of organic substances on yield and quality of onion, *Allium cepa* L International Journal of Farm Sciences 2015;5(1):30-35.
3. Chadha S, Rameshwar, Ashlesha, Saini JP, Paul YS. Vedic Krishi: Sustainable livelihood option for small and marginal farmers. Indian Journal of Traditional Knowledge 2012a;11(3):480-486.
4. Chadha S, Rameshwar, Ashlesha, Saini JP, Paul YS. Vedic Krishi: Sustainable livelihood option for small and marginal farmers. Indian Journal of Traditional Knowledge 2012b;11(3):480-486.
5. Chavan DL, Chavan NH, Choudhary SM. Effect of different organic manures on growth and yield of onion (*Allium cepa* L.) Thebioscan 2016;11(4):2529-2532.
6. Ganie NA, Solanki RB. Quality characters of Kharif Onion as affected by concentration of cycocel, intra row spacing and levels of nitrogen. International Journal of Agricultural Science 2010;6(1):46-47.
7. Kumar Sharvan, Trivedi Himanshu, Sah Rahul, Verma Amit Kumar, Atul Yadav. Effect of different bio-enhancers on growth & yield of cauliflower (*Brassica oleracea* L. Var. *Botrytis).* Journal of Pharmacognosy and Phytochemistry 2018;SP1:769-772.
8. Pathak RK, Ram RA. Bio-enhancers: A potential tool to improve soil fertility, plant health in organic production of horticultural crops Progressive Horticulture 2013;45(2):237-254.
9. Patidar Ankit, Kumar Raviendra, Kumar Uday, Indra Kumar Kemro. A studies on the effect of different organic sources on onion (*Allium cepa* L.) productivity and soil health Journal of Phar cognosy and Phytochemistry 2019;8(3):1069-1072.