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RESEARCH ARTICLE

Evaluation of the performance of onion varieties in response to organic cultivation

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Abstract

An experiment was conducted to evaluate the performance of different onion varieties in response to organic condition during the Rabi season of the year 2014-15.The soil was prepared with recommended doses of vermicompost as soil nutrient. The Pre harvest effect of the commercial Bio based product namely; *Trichoderma viridae*, Neem, Panchgavya and Water were studied. It was revealed from the Data, Maximum vegetative growth (Plant height, Number of leaves,) and Bulb growth (Bulb diameter, Bulb weight,) was observed in case of Panchgavya treatments. A similar observation was made in the case of neem and *Trichoderma viridae* application as compared to control.

INTRODUCTION

Onion (*Allium cepa* L.) is one of the most important vegetable and commercial vegetable crops for a long time and consumed worldwide for centuries together (Best., 2000). It is used not only for internal consumption but also as highest foreign exchange earner among the fruit and vegetables. Due to its flavoring properties used daily in every household. So, it is known as queen of the kitchen (Selvaraj., 1976).Due to its distinctive properties alliaceous aroma, this account for their use as food. It is used in diverse forms of food like; salad, soups, spices, condiments, as a medicine, Flakes and salts (Augusti., 1990). Onion has the properties to prevent heart diseases and other ailments. Onion crop is sown in Rabi and Kharif seasons. The production and supply of onion has a great impact on prices as the demand of onion never curtailed despite the rise in prices and this is clearly evident from the price hike in September 2013 and recently in 2015.

Organic agriculture is getting hold of movement in India due to individual as well as group efforts to protect environment and contamination of farm produce from use of chemical fertilizers and pesticides. This is the method of cultivation that works at the grass root level which preserves the reproductive and regenerative capacity of the soil and plant nutrition. The heavy use of chemicals has led to degradation of soil, water and ultimately the quality of food materials. So, at this moment a keen awareness has started in all parts of India for adoption of organic cultivation to cure the ills of modern chemical agriculture (Kannaiyan., 2000).

The organic onion is flourishing mainly due to consumer choice. The organic onion is much preferred than traditionally grown. It makes an increase in varieties and selection of onion in retail, supermarket and restaurant. The use of inorganic chemicals such as pesticides and fertilizer has been escalated since the beginning of 20th century. The conventional methods of fertilization and application of inorganic chemicals have undoubtly helped in the both bulb yield and quality of bulb. But, in India the routine management practice appear to be incapable of maintaining yield over the long period. The steady reduction of soil fertility and occurrence of several nutrient deficiencies in onion field has led to the reduced onion production (Sharma *et al.,* 2003).

It is very much essential to develop sustainable and compatible good agriculture practices through organic resources for different crops based on scientific facts.

Although, a very little research has been performed on agricultural cultivation practices (conventional vs organic) to clarify the effect on human health through food (Worthington; 1998, Woese *et al*; 1997). During the past ten years there is a gradual shift from purely inorganic to organic cultivation. To fulfill the demand of domestic as well as international market the area of onion cultivation is continuously increasing in the last five years.

Presently, India ranks 10th among the top ten countries in terms of area under organic certification. India produced approximately 1.24 million MT of certified organic products in all varieties of foods. Among all the states Madhya Pradesh is the highest producer of organic produce followed by Himachal Pradesh and Rajasthan. India exported 135 products in the year (2013-14) with the total volume of 194088 MT (APEDA-2013).Due to various agro climatic regions India has the potential to produce all varieties of organic products. The farmer can get good remuneration from the organically produced onion due to their heavy demand in national and international markets (Singh., 2005).

India has implemented the National Programme for Organic Production (NPOP) for promoting the organic cultivation in the country. The extensive use of inorganic chemical is harmful and has long term impact on the health of soil and the human beings. The problem of high cost of chemical fertilizers used for cultivation entirely meet nutrient requirement of crop by the single source such as organic matters like farmyard manures, vermicompost, biofertilizer,Neem and Panchgavya. So, an effective strategy Integrated Nutrient Management (INM) plays a vital role (Dimri and Singh, 2005.,Santhi *et al.*, 2005). It is a strategy which is capable of taking into consideration, the sustainability of onion productivity as well as the preference to maintain a strong dependence on regional natural resources.

Therefore, organic cultivation has become necessary for sustaining the soil fertility and human health. For the last many years organic cultivation is getting hold of the significant role as an alternative of inorganic chemical to reduce the high cost of cultivation and for sustainability. Since onion is one of the most important vegetable crops, conventional farmers mostly apply high doses of synthetic fertilizers and pesticides to increase the productivity and prevent damage from the harmful insects. However, it has been found that these harmful chemicals are slowly causing damage to the human immune system. We know that the successful onion production mainly depends upon the selection of most appropriate varieties that are adapted to different conditions imposed by particular environmental conditions. There are wide variations found in different onion cultivars in bulb yield and bulb quality. Modern varieties are highly responsive to fertilizers. In view of the subsequent facts, an experiment was conducted to evaluate the performance of different onion varieties in response to organic cultivation with an objective of studying the effect of natural biocides on the promising onion varieties grown for Haryana region.

Material and methods

An experiment was conducted to evaluate the performance of different onion varieties in response to organic cultivation. The cultivars used in the experiment were local popular varieties of winter season (Rabi Season) namely; Pusa Madhavi, Pusa Riddhi, Pusa Red, NHRDF Red, and Agri found Light Red at nursery area, NIFTEM campus during the year 2014-15.

Nursery preparation:

The Nursery bed of 2 m long and 1.2 m wide and 10 cm above from the ground level prepared and manures were applied then treated seed purchased from (IARI, New Delhi) was sown at the rate of seed rate 8 kg/ha on 9 November 2015.After sowing, the seeds were covered with fine powered farmyard manures following by light irrigation. All the intercultural agricultural operation was done as the requirement.

Field preparation:

The experimental Field was prepared for transplantation. Field was ploughed properly to eliminate debris and soil clods. Organic manures Vermicompost at the rate of 7.5 t/ha was applied at the time of soil preparation. Two month old seedlings of uniform size were transplanted on 17 January 2015. The spacing 15 cm , row to row and 10 cm, plant to plant was maintained properly .The experiment was carried out in the Randomized Blocks Design (RBD) with three replications following treatment in preharvest stage were applied at 15 days interval *viz* Control, Besara (Neem) 20ml/lt, Bio-shield (*Trichoderma viridae*) 50gm/lt and Panchgavya 20ml/lt . Five plants in each plot were selected randomly for recording observation. The crop was harvested on 27 may 2015.

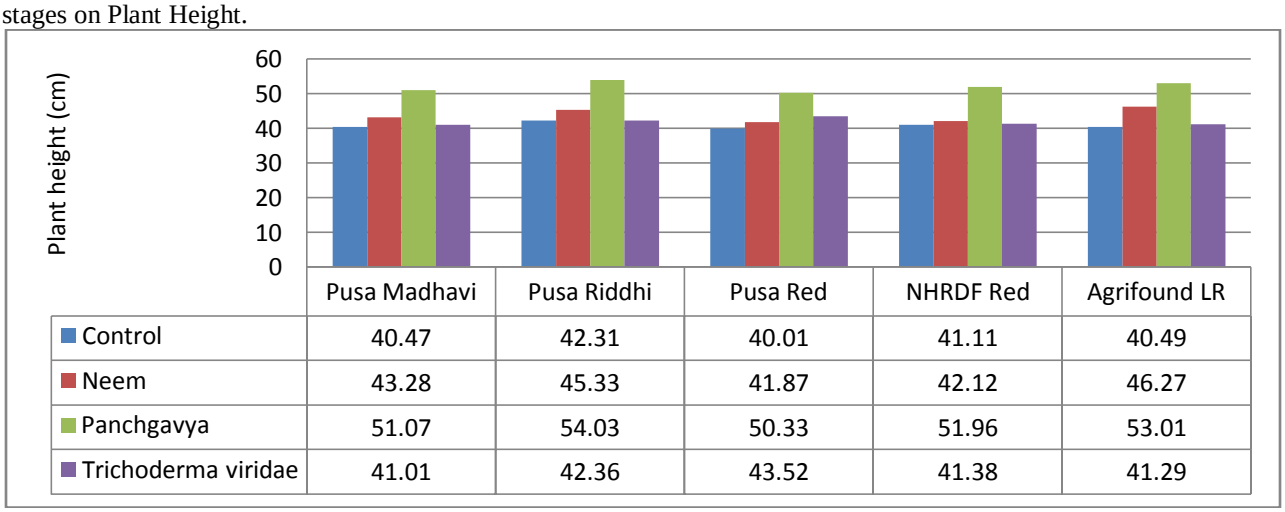
The field used in the experiment was not cultivated previously for many years. During the experiment we did not apply any type of synthetic fertilizers or chemicals in the field. From transplantation till harvesting pest and disease incidences were not observed in standing crop and weeding was carried out five times during the growth period. The plots were irrigated ten times through the growing period.

The characteristics studied were recorded after harvesting on Plant height (cm), Number of Leaves, Bulb Diameter (mm), Bulb Weight (g).

Result and discussion

It was found that among all the promising onion varieties Pusa Riddhi has best effect on vegetative yield and other traits. The treatment wise result shows best effect in Panchgavya and Neem application in all the onion varieties. It is apparent from the data presented in Table 1 that different varieties have the better effect. Panchgavya is a Vedic formulation used as bio fertilizer for increasing productivity and disease resistance in plants. Neem is natural product which solve agricultural, environmental and public health problem. It contains several thousands of chemical compounds. Both the applications showed better response in all the characteristics of onion.

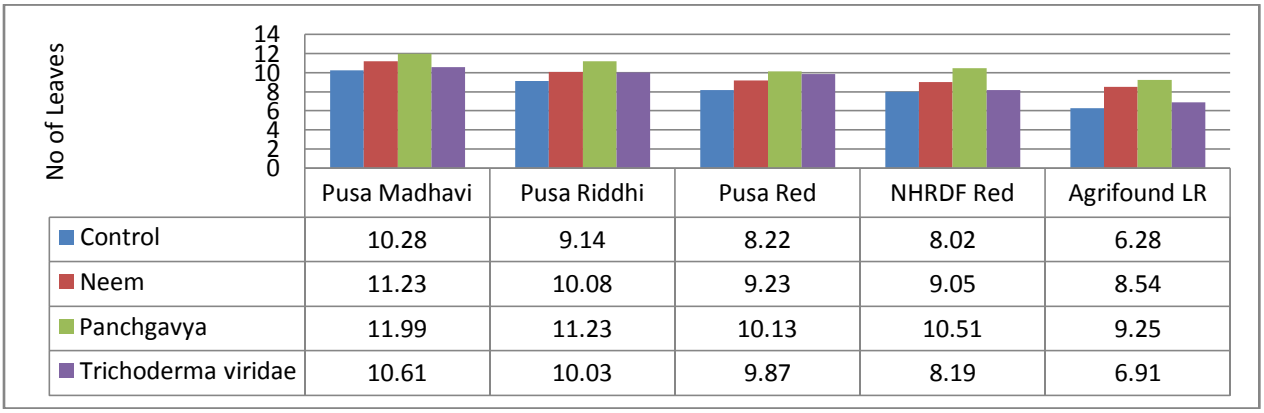
Table -1.Effect of Vermicompost used as Soil Nutrient and Biofungicides applied as foliar sprays at Pre-harvest stages on Plant Height.



	Pusa Madhavi	Pusa Riddhi	Pusa Red	NHRDF Red	Agrifound LR
Control	40.47	42.31	40.01	41.11	40.49
Neem	43.28	45.33	41.87	42.12	46.27
Panchgavya	51.07	54.03	50.33	51.96	53.01
Trichoderma viridae	41.01	42.36	43.52	41.38	41.29

The results revealed that vermicompost is one of the best sources to produce highest growth in plant height. This positive performance is due to combined effect of vermicompost and of Panchgavya when applied as foliar spray at the different growth stages. Vermicompost has the potential to improve nutrient availability to growing crop (Singh *et al.*, 2001).Vermicompost has several plant growth hormones, enzymes, beneficial bacteria and Mycorrhizae (Gupta, 2005).Panchgavya application enhanced the growth and vigor of other crop i.e. turmeric, paddy, sugarcane, banana (Natarajan., 2002).It was found that among all the cultivar Pusa Riddhi has highest plant growth followed by Agrifound LR, NHRDF Red, Pusa Madhavi and Pusa Red.

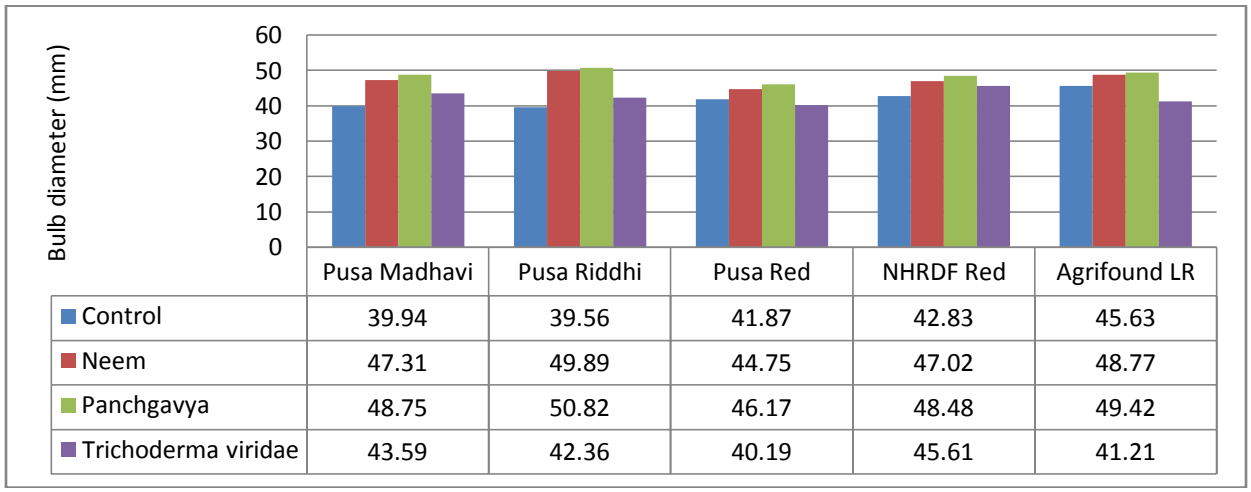
Table-2.Effect of Vermicompost used as Soil Nutrient and Biofungicides applied as foliar sprays at Pre-harvest stages on Number of Leaves.



	Pusa Madhavi	Pusa Riddhi	Pusa Red	NHRDF Red	Agrifound LR
Control	10.28	9.14	8.22	8.02	6.28
Neem	11.23	10.08	9.23	9.05	8.54
Panchgavya	11.99	11.23	10.13	10.51	9.25
Trichoderma viridae	10.61	10.03	9.87	8.19	6.91

The obtained results in the graph shows that the onion cultivar Pusa Madhavi best performer in number of leaves among all the cultivar.

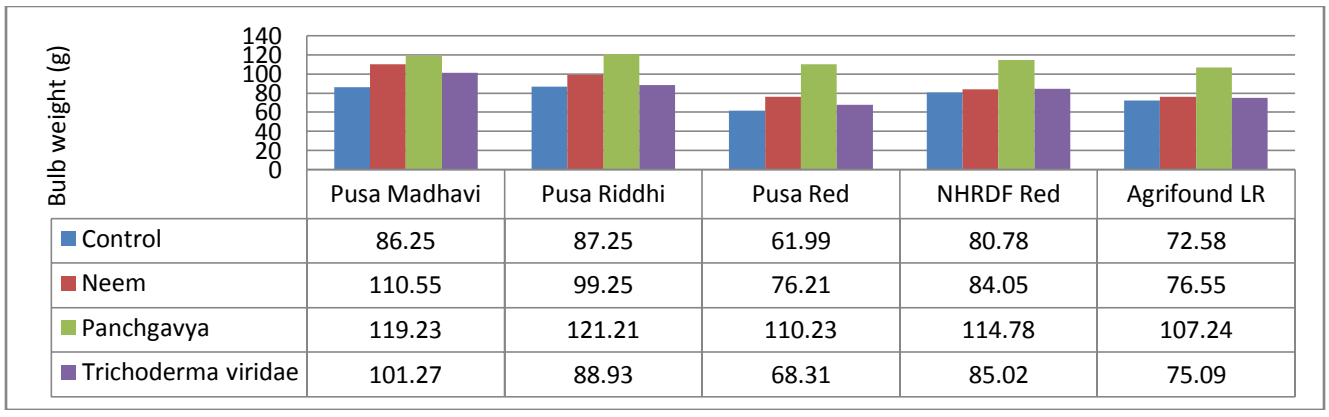
Table-3.Effect of Vermicompost used as Soil Nutrient and Biofungicides applied as foliar sprays at Pre-harvest stages on Bulb Diameter



	Pusa Madhavi	Pusa Riddhi	Pusa Red	NHRDF Red	Agrifound LR
Control	39.94	39.56	41.87	42.83	45.63
Neem	47.31	49.89	44.75	47.02	48.77
Panchgavya	48.75	50.82	46.17	48.48	49.42
Trichoderma viridae	43.59	42.36	40.19	45.61	41.21

The graph showed that the effect of vermicompost as soil nutrient and Panchgavya followed by Neem has the noticeable effect on almost all the cultivars. The interaction between onion cultivars and bio fungicide treatments significantly affected bulb diameter. Same results are also found (Kandil *et al*., 2013) with maximum bulb diameter in different onion cultivars. Similarly (Swaminathan *et al* ., 2007) reported that application of panchgavya at 3% foliar spray on black gram recorded the highest grain yield.

Table-4.Effect of Vermicompost used as Soil Nutrient and Biofungicides applied as foliar sprays at Pre-harvest stages on Bulb weight.



	Pusa Madhavi	Pusa Riddhi	Pusa Red	NHRDF Red	Agrifound LR
Control	86.25	87.25	61.99	80.78	72.58
Neem	110.55	99.25	76.21	84.05	76.55
Panchgavya	119.23	121.21	110.23	114.78	107.24
Trichoderma viridae	101.27	88.93	68.31	85.02	75.09

The panchgavya has played a noticeable role in the Bulb Weight as compared to control. There are wide variations among onion cultivars in bulb weight. Thus, selecting the best onion cultivar is one of the most essential components of onion production in India specially Haryana region.

The result shows that Pusa Riddhi cultivar has the positive response of Panchgavya followed by Pusa Madhavi and NHRDF Red. From the following observations it can be concluded that Panchgavya contains plant growth substances which brings speedy change in phenotype of plants and also improve the productivity of plants. Panchgavya is used as foliar nutrition for various agricultural and horticultural crops. The similar results of

Panchgavya application on higher growth in various vegetable crops has also been reported by Tharmaraj *et al*., 2011 and Somasundaram *et al.,* 2007.

Conclusion

Organic cultivation of onion is done to maintain sustainability, higher crop productivity, improving soil quality and soil productivity. The supply of adequate nutrients to produce onion can be done in organic cultivation. In India, the adoption of organic cultivation of onion is possible because this crop has high export potential in international market. Moreover, the productivity is lower in organic cultivation but it is cheaper and affordable and also can be produced and reduce the cost of cultivation. It is also maintains the fertility of the soil. In the present experiment, vermicompost applied to soil was effective in the enhancement of vegetative growth whereas pre harvest foliar spray of Panchgavya and Neem in the cultivar Pusa Riddhi led to bulb growth. Promotion of growth in all the characteristics was also observed in the case of Panchgavya.

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