

## RESEARCH NOTE

## Organic Potato in Nalanda (Bihar): Using Eco-Friendly Agri. Bios Inputs

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### ABSTRACT

*Organic agriculture seeks to augment ecological processes that foster plant nutrition while conserving soil and water resources. Organic systems eliminate agrichemicals and reduce other external inputs to improve the environment as well as farm economics. It is a production system, which favours maximum use of organic materials like crop residues, FYM, compost, green manure, oil cakes, bio-fertilizers, bio-gas slurry etc. to enhance crop production and improve soil health. Organic production systems are based on specific and precise standards of production which aim at achieving agro-ecosystems which are socially and ecologically sustainable. As demand for organically grown food has been growing rapidly and significant proportion of consumers believe that organic food is qualitatively better than non-organic, the present study showed not only the quality of the produce but also produces quantitatively higher yield that touched the world record production in Nalanda, Bihar.*

**Keywords:** Organic potato; Chemical fertilizers; Potato yield;

Potato (*Solanum tuberosum L.*) popularly known as “The king of vegetable” has emerged as the fourth most important food crop in India after rice, wheat and maize. Indian vegetable basket is incomplete without potato. Being a short duration crop, it produces more quantity of dry matter, edible energy and edible protein in lesser duration of time than cereals. Hence, it may prove to be a useful food to achieve nutritional security of the nation.

In Nalanda, potato cultivation has been taken up in a wide coverage (approx 28,000 ha) by a large number of small and medium land holding farmers. Potato crop is very susceptible to an extremely serious disease i.e. late blight. They were applying most poisonous pesticide to get rid of this disease. In the same way, there were high consumption of chemical fertilizers and pesticides/insecticides in vegetable cultivation to make it disease and insect-pest free. In this context, cultivation of vegetables became so cost intensive that farmers’ did not get handful returns in proportion to this investment.

With the support of district administration, farmers’ started organic farming under the government scheme with certification by an international agency ECOCERT. They realized the profit in terms of quality and quantity. All the organic vegetable growers united and formed

Nalanda Organic Vegetable Growers Federation which initiated marketing for vegetables directly from field to consumers. The federation also arranges training to the farmers and plans in all aspects for the better qualitative yield and better market for farmers’ family. The aim of this evaluation of the Nalanda organic project was to make it example for other farmers.

*Organic initiative in Nalanda, Bihar:* Bihar government planned a major programme in 2011-12 for taking up a large scale organic farming. The Hon’ble Chief Minister of Bihar declared a major initiative by organizing International Conference on Organic Bihar in June 2011. A model showing how packages of eco-friendly agri bios inputs can substantially reduce the agricultural inputs cost and at the same time improved farm productivity was developed. The government started execution of Nalanda Vegetable Initiative Programme with the following aims-

- i. To provide food security by increasing production and productivity of vegetables organically.
- ii. To increase the farmers income by establishing vegetable supply chain.
- iii. To provide opportunity of employment to skilled and semiskilled especially unemployed youth.

In Nalanda, the farmers are progressive, committed, innovative and hard working despite having small size of land holdings. It was appropriately thought that a right guideline for eco-friendly organic model can convert this into an opportunity to these progressive farmers. For implementation of this programme in Nalanda, selection of site, baseline survey of the selected site, soil health card preparation, group formation under Agricultural Technology Management Agency (ATMA) training (on campus/off campus), initial supply of basic organic inputs as substitute for chemical fertilizers and pesticides, development of on-farm facilities like Kishan Pathshala, preparation of vermicompost, storage facility, irrigation facility, certification of organic produce promotional activities were done in a planned way. The government schemes, farmers innovating attitude and the district administration planning together make the project successful.

## METHODOLOGY

The evaluation was carried out in the farmers' field at Darbeshpura village in Nalanda District (Name of the farmer: Nitish Kumar) in Bihar who held the world record production of potato. Farmers' participatory method was adopted for evaluation of the success.

### *Organic package for potato*

Nutrient Management	Product Recommended
Main field preparation	Biofertilizer + Vermicompost + <i>Trichoderma viridae</i>
At the time of sowing	Seed treatment with <i>Trichoderma viridae</i> 5gm/kg of seed
Germination & Vegetative Development	Liquid Biofertilizer @ 1 Ltr./acr. In the root zone
30 days after germination	Granule Biofertilizer 10kg/acr. + Root growth promoter 2kg/acr. With FYM
50-60 days after germination	Liquid growth promoter 1Ltr./acr. In root zone through drenching
70-80 days after germination	Bio aminomix @ 4 ml/ltr. of water
<i>Disease &amp; Pest Management</i>	
All stage disease mgt.	<i>Trichoderma</i> @ 2 kg/acr.
Early & late Blight	Biofungicide @ 5 gm./ltr. of water
For other pests	Neem oil @ 4 ml/ltr. of water or Biopesticides 5 gm/ltr. of water

### *Eco organic package for potato - A typical case*

Inputs Name	Amount/ha
Cow dung	1500 kg.
Vermicompost	100 kg.
Poultry Manure	100 kg.
Granules Biofertilizer	10 kg.
Soil Conditioner	20 kg.
Root promoter	6.25 kg.
Seed treatment	2.5 kg.
Liquid Biofertilizer	2.5 ltr.
Liquid Growth Promoter	2.5 ltr.
Growth Enzyme	2.5 ltr.
Bio fungicide	2.5 kg.
Botanical Biopesticide	2.5 ltr.
Power Biopesticides	2.5 kg.

Note.- The farmer also used 12 kg/ha of NPK mixture but other than that no chemical fertilizer or pesticides were used.

The said farmer of Darbeshpura has adopted the green leaf manuring process using Dhaincha (*Sesbania aculeata*) to enhance the soil fertility. Following soil treatments with solarisation, *Trichoderma viride* mixed with vermicompost, seed/seedling treatment with *Trichoderma viride*.

## RESULTS AND DISCUSSION

It was already reported that in the village Darbeshpura of Nalanda District, Bihar about 65 ha of land was taken up for organic cultivation of potato with the above mentioned package of practices. A small but progressive farmer named Nitish Kumar has been growing potato in his farm and the yield of potato in the 5 consecutive years is given in Table 1.

**Table 1. Year-wise potato yield (t ha<sup>-1</sup>) in Nalanda using different sources of organics and inorganics.**

Year	Production (t ha <sup>-1</sup> )	Input used
2007-08	53.0	Chemical
2008-09	25.5	Chemical
2009-10	47.0	Chemical + Organic
2010-11	60.0	Chemical + Organic
2011-12	72.9	With the above packages

Harvesting of potato was done under the supervision of Agriculture Scientists, Agriculture and Horticulture Officer. A recorded production of 72.9 t ha<sup>-1</sup> was reported.

*Validation of the on-farm demonstration trial:* Validation of the said world record production was

**Table 2. Influence of organics on tuber yield ( $t\ ha^{-1}$ ), ascorbic acid ( $mg\ 100g^{-1}$ ), Carotene ( $mg\ 100g^{-1}$ ) and phenol ( $mg\ 100g^{-1}$ ) content of potato.**

Treatments	Tuber yield	Phenol	Carotene	Ascorbic acid
Control	18.2	8.56	5.08	13.25
FYM	34.7	12.61	9.26	20.13
Vermicompost	46.3	13.57	9.84	19.67
Poultry manure	44.9	12.84	8.67	20.38
NPK	26.5	9.14	5.91	13.62
NPK+FYM	53.6	13.02	8.74	18.95
NPK+	49.8	13.09	8.59	20.32
Vermicompost				
NPK+	56.7	11.39	9.01	18.74
Poultry manure				

verified at College of Horticulture, Noorsari, Nalanda, Bihar as to the influence of organic inputs on yield as well as quality of potato and results revealed that organics (FYM, vermicompost and poultry manure) had significant edge over the conventional fertilizer (NPK) management practices. Application of all the organic inputs significantly influenced the tuber yield of potato to the level of 2 to 2.5 times than that of control as well as lone NPK fertilization. On an average, tuber yield of potato tuber varied from 18.2 to 56.7 q/ha with a mean value of 41.3 q/ha (Table 2). The highest tuber yield was found with the application of NPK+ poultry manure followed by NPK+FYM and NPK+ vermicompost. Application of organics significantly increased the phenol, carotene and ascorbic acid contents in potato tuber. Phenol content in potato tubers varied from 8.56 to 13.57  $mg\ 100g^{-1}$  with a mean value of 11.77  $mg\ 100g^{-1}$ . Application of organics, on an average, increased the phenol content in potato tubers to the tune of 45 to 60% indicating the significant influence of organic inputs on phenol content in potato. Likewise, carotene and ascorbic acid content in potato tubers varied from 5.08 to 9.84 with a mean value of 8.14 mg

$100g^{-1}$  and 13.25 to 20.38 with a mean value of 18.13  $mg\ 100g^{-1}$ , respectively. Application of organics also increased the carotene and ascorbic acid content to the level of 40-45 per cent over the control. Thus application of organics could not only be beneficial to enhance the yield of potato tuber but also to improve the quality parameters i.e. antioxidant contents viz. phenol, carotene and ascorbic acid in edible plant parts.

## CONCLUSION

It was reported earlier that the previous record of potato production (Netherlands) was about 45.0 ton/ha. The entire cultivation was done organically with the use of cow dung compost. The previous average yield from the same area with chemical cultivation was approx 30.0 ton/ha. This world record production of organic inputs has disproved the belief that chemical inputs can give higher yield (Medhat *et al.* 2011). The higher yield of potato under organic cultivation might possibly be due to the effect of bio-fertilizer and organic manure on microbial densities in the rhizosphere of potato plants, on nitrogen forms in the rhizosphere of potato plants, on total nitrogen and phosphorus in the rhizosphere of potato plants, on growth parameters of potato plants, on total nitrogen and phosphorus uptake, on tuber number per kg. of potato, total carbohydrate (%) and tuber yield, on availability of some macro and micro nutrients. Umashankar *et al.* (2010) also reported that organic inputs have an edge over the conventional chemical fertilizer management practices on growth and yield of potato in Chhattisgarh in rice-potato cropping system.

From this present investigation, it is clearly evident that organic potato production is possible by following appropriate scientific organic practices with emphasis on organic nutrient supply through available manures and biofertilizers.

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## REFERENCES

- Medhat, Y.A.Z. and Bakry, M.A. A. (2011). Integrated effect of bio-organic manures and mineral fertilizers on potato productivity and the fertility status of a calcareous soil. *Australian J. of Basic and Applied Sci.*, **5** (8): p. 1385.
- Umashankar, J. S., Chitale, S. and Tiwari, A. (2010). Effect of organic versus chemical nutrient packages on productivity, economics and physical status of soil in rice (*Oryza sativa*) and potato (*Solanum tuberosum*) cropping system in Chhattisgarh. *Indian J. of Agro.*, **55** (1): 6-10.

