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FRONT LINE DEMONSTRATION OF PLANT EXTRACT BASED BIO FUNGICIDEON MANAGING POTATO CROP DISEASES

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ABSTRACT: The present study was conducted by Directorate of Extension, Sam Higginbottom University of Agriculture, Technology & Sciences, Prayagraj (U.P.) India, during 2023-24 in the Rabi season with demonstrations on potato covering an area of 6.50 hectare in Bhadohi district of Uttar Pradesh to exhibit the use of botanical extract Controller for the control of phytoplasmic and viral diseases in early cultivation of potato. Phytoplasmic diseases as purple top , which is broom and viral mainly alfa alfa mosaic, potato virus Y on early maturing variety Pukraj that fetches good price to farmers due to early maturity. Climate also plays an important role during this cultivation, higher temperatures aggravate these diseases. Generally the crop is harvested between 85 to 100 days as at that time table potato rates are high. Weekly spray of Controller@ 5ml per litre water was done till the date of harvest. The control was treated with chemical fungicides on as and when required basis. The study was very interesting as for the first time we came across a product that claimed a check on phytoplasmic and viral diseases.. The results were compared between Field Demonstration plots and control plots. From the demonstrations, it was observed that the improved potato variety kufri Pukhraj recorded the higher yield 325q/ha compared from the fields treated with Controller and 302 q/ha when the fungal management was done by the useof Mancozeb when 95 days crop was harvested. The increase in the demonstration yield over control was 7.07 per cent. The extension gap, technology gap and technology index were recorded 23.00q/ha, 50.00q/ha and 15.38% respectively in the trial of potato crop. The increment in yield of potato crop under demonstrations of foliar spray of bio extract (Controller) was due to the retardation of phytoplasmic, viral diseases and the increase in the size of the tubers in treated plots. . Use of bio extract such as Controller gave higher mean net return of Rs. 580200.00per hectare with a benefit cost ratio 5.67 as compared to chemical fungicide (Rs. 481180.00 per hectare benefit cost ratio 5.00).

KEY WORDS: Field demonstration, Potato, Botanical extracts, yield, extension gap, technology, gap, technology index, BC ratio.

Potato (*Solanum tuberosum L.)* a solanaceae family plant, is very popular and important vegetable grown in all over world. It is the fourth important crop after maize, wheat and rice. Potato (*Solanum tuberosum L.*) is a high yielding, nutrient exhaustive and short duration crop needs higher quantities of fertilizers and plant is protection as compared to other crops. A normal potato crop yielding 30 t/ ha removes about 100 kg N/ ha from soil (Pandey et al., 2006). However, continuous and excessive use of chemical fertilizers is causing ecological and health hazards as well as deteriorating the soil health resulting decline in crop yields. Under these circumstances, organic sources play a vital role in improving the soil fertility and productivity of crop.

Two major challenges need to be addressed for sustainable organic potato production ensuring adequate mineral nutrition of potato crop , reducing stresses that result in diseases. . In this regard, the selection of effective and safe microbiological fungicides to reduce the population density of phytopathogenic species is of particular importance. Judicious use of organic manures with chemical fertilizers and the use of bio pest control measures can be an effective solution. In organic farming, plants are healthy as they are provided with provided with sufficient nutrients and favorable micro biota. This contributes to an increase in plant disease resistance and protection from phytopathogenic microorganisms. At the same time, a favorable micro biota promotes the supply of more nutrients to the plants, which, in turn, promotes more active plant growth. The considered model of organic potato predicts its development, using the emerging weather characteristics, forming favorable soil conditions and regulating the composition of its micro ecosystems by introducing biological products based on microbes-antagonists of phytopathogens.

One of the significant worries in this day is the quick genetic degradation especially in crops prone to phytoplasma, .Its effect is visible in sugarcane, apple ,grapes crops greatly infected with phytoplasma. Non judicious use of fertilizers could be a reason for it Natural nitrogen and phosphorus, ecologically benevolent manures creatures, for example, microscopic organisms, growths and cyanobacteria might be considered as the watchword for taking care of such issue. Thus, this may upgrade plant supplements take-up and advance plant development. Moreover, the awareness towards the use of organically grown food especially chemical free vegetables and fruits is also a major concern of study in this research. We have tried to reduce the use of chemical fungicides.

Conducting of front line demonstrations on farmer's field help to identify the constraints and potential of the potato in specific area as well as it helps in improving the economic and social status of the farmers. The aim of the front line demonstration is to convey the technical message to farmers that if they use botanical extracts in place of chemicals could lead in higher production and quality crop. The improved technology packages were also found to be financially

attractive. Yet, adoption levels for several components of the improved technology were very low, emphasizing the need for better dissemination (Kiresure *et al*, 2001). Several biotic, abiotic and socio-economic constraints inhibit exploitation of the yield potential and those needs to be addressed.The distrct Bhadohi of Uttar Pradesh has sizeable area under potato cultivation but the productivity level is medium. The reasons for medium productivity are poor knowledge about improved crop production and protection technologies and their management. Keeping the above point in view, the front line demonstrations on potato using improved production technologies with special emphasis to phytoplasma and viral control in early potato crop was studied conducted and the regular use of Controller was found to be effective in controlling purple top , witches broom potato virusY and other mycoplasmicdiseases.

MATERIALS AND METHODS

Demonstration for the study of botanical extract Controller were made where controller botanical extract was sprayed at weekly intervals on the potato crop from 4 leaf stage to the final day of harvest @ 5ml per liter water and chemical spray of fungicides on as and when required basis. Insect control was done with insecticides. They were spayed in same frequency on treated and control. Experiments were conducted by the Directorate of Extension, Sam Higginbottom University of Agriculture, Technology and Sciences,Prayagraj during Rabi season of 2023-24 at the farmer's field of five adopted villages in Bhadohi district of Uttar Pradesh. An area of 6.5 ha was covered with plot size0.25 ha under front line demonstration with active participation of 20 farmers.

Material for the present study with respect to FLDs and control has been given in table-1. In case of local check plots, existing practices being used by farmers were followed. In general, the soil of the district is sandy loam in texture, which is low organic carbon (0.02–0.46%), available phosphorus (10–12 kg/ha) and medium to high in potash. Comparison was made between the regular use of Controller botanical fungicide at weekly intervals and chemical fungicide 'as and when required. In demonstration plot, regular use of Controller fungicide was done at weekly intervals and the use of chemical fungicides was done as and when required through front line demonstration of different locations.

ABOUT BIO FUNGICIDE (CONTROLLER)

This product Bio Extract (**Controller**) is made by the Hari Organic Manure Limited, Janakpuri, district Saharanpur. Controller is an extract of herbs which cures phytoplasmic and other incurable diseases in plants. These diseases often occur in vegetables, fruits and flowers. **Controller** increases the resistance power of the plant. As a result, the controller creates strength in the plants to fight incurable diseases. These diseases usually come from seeds and soil and weaken the plant's immunity. Regular spray of bio fungicide, 4 -5 ml/liter water or 600-800 ml. Repeat after 7 days in adverse weather. While other side we use the chemical fungicides such like Mancozeb in same half part of the field as and when required and then found the production effect on the crop.

Visit of farmers and extension functionaries was organized at demonstration plots to disseminate the message at large scale. The demonstration farmers were facilitated by Directorate of Extension Scientists in performing field operations like sowing, weeding, irrigation, spraying, bio extract and harvesting etc. during the course of training and visit. The necessary steps for selection of site and farmers, layout of demonstration etc. were followed as suggested by **Choudhary (1999).** The traditional practices were maintained in case of local checks. The data were collected from front line demonstration plots as well as control plots (farmer's practices) and finally the extension gap, technology gap and technology index were worked out **(Samui *et al.*, 2000).**

RESULTS AND DISCUSSION

The crop yield of potato obtained under recommended practices as well as farmer's practice is presented in table 2. The crop yield of potato 325 q/ha, under demonstration plot regularly treated with bio extract **Controller** as against a yield 302 q/ha in control plots with chemical fungicide. In comparison to control plots, there was an increase of 7.07 % higher tuber yield, during 2023-24. The higher production of potato crop yield obtained under recommended practice was due to the retardation of phytoplasmic, viral diseases and the increase in the size of the tubers in treated plots. The similar results of yield enhancement in potato crop impact of demonstration have been documented by Lalit *et al*. (2015) andMbuyisa *et al*. (2023).

Extension and technology gap

The extension gap showed an increasing trend. The extension gap during the study observed 23.00q/ha which emphasizes the need to educate the farmers through various means for adoption of improved agricultural production technologies with the use of botanical products in order to counteract the trend of the vast extension gap. This frightening tendency of the use of chemical fungicides that prevails in the mind of the farmer can be easily overpowered by the use of botanical pesticides in the cultivation of potato.

The technology gap is the difference between the demonstration yield and potential yield. The technology gap was observed 50.00 q/ha during the study period. This gap exists due to variation in the soil fertility and climatic conditions. These findings are similar to the findings of Lalit *et al*. (2015) and Ehiobu *et al*. (2022). Technology index showed the feasibility of evolved technology at the farmer's field. Thelower is the value of technology index; the more is the feasibility of technology demonstrated. The technology index was observed 15.38% during the period may be attributed to the difference in the soil

fertility status, weather condition insect–pest and diseases attack on the crop. The results of the present study are in recurrence with the findings of Mbuyisa *et al*. (2023).

Yield attributing parameters

The yield attributing parameters like tuber weight (g) and tuber yield per ha of potato obtained from treated and control plots which include demonstration plots treated with Controller at weekly intervals and the control plots treated with chemical fungicides on "as and when required basis" are presented in table 3. The tuber weight (g) of potato ranged from 100.50 to 140.90 under treated conditions as against a range from 80.50 to
120.50 recorded under control. Similarly, higher yield per acre recorded under treated plots ranged between 30 to 34 tons as compared to control plots ranging from 25 to 30 tons. The higher tuber weight and tuber yield of potato in treated as compared to control is due to the regular use of the recommended dose of bio extract **(Controller)** and timelyirrigation management on potato crop during the year of demonstration similar results have been reported earlier by Akbar *et al*. (2012) and Mbuyisa *et al*. (2023).

Economics of front line demonstration

The inputs and outputs prices of commodities prevailed during the year of demonstration were taken for calculating cost of cultivation, net returns and benefit cost of ratio (table 4). The investment on production by regular spray of Controller at weekly internal was Rs. 102300 per ha against control Rs. 96320. Cultivation of potato crop under demonstration condition with the regular use of botanical extract Controller gave higher net return of Rs. 580200 per ha compared to Rs. 481180 per ha in control plots under chemical fungicides during the study. The average benefit cost ratio in treated plots was 5.67 and that of control plots was 5.00. This is the result of the use of botanical extract giving higher yields and better marketing prices due to the size and color in treated plots. Similar results have been reported earlier on potato by Singh *et al*. (2012) and Pradeep (2015).

CONCLUSIONS

The productivity enhancement demonstration over control in potato cultivation created greater awareness and motivated the other farmers to adopt the use of Controller in early cultivation of Pukraj when it is to be harvested within three months of sowing. The demonstration's results underline the potential for **increased productivity and profitability** in potato cultivation when using advanced methods like bio fungicide Controller. However, to fully leverage this potential, **extension services, resource accessibility, and farmer education** must be strengthened. Additionally, fine-tuning the technologies based on **local conditions** and continuously monitoring the outcomes will help further bridge the technology and extension gaps.

The use of **botanical extracts** for plant pest management, as seen in the study with the bio fungicide **Controller**, aligns well with the current trend of **organic farming**. This shift reflects farmers' growing interest in sustainable agriculture, where there is a focus on reducing reliance on synthetic chemicals and adopting natural alternatives and has increasingly gained attention from both consumers and the government over time.

Table-1: Particulars showing the details of Potato grown under impact of demonstrations and farmers practices (2023-24)

S. N.	Particulars	Demonstration plots	Control plots
1	Improved variety	Kufri Pukhraj	Kufri Pukhraj
2	Seed rate	20-22 q /ha	20-22 q /ha
3	Time of sowing	5 Oct to 10 Nov	5 Oct to 10 Nov
4	Insect management	Chemical insecticides	Same as in treated
5	Seed treatment	Seed Treatment with bio fungicide Controller	Carbendazim 50 WP @ 2.5 gm/kg seed
6	Use of Bio fungicide	Controller-Plant extract bio fungicide with technical guidance	Mancozeb and Copper-based fungicides
7	Basal Application of fertilizers	120 N:60P:90 K (kg/ha)	120 N:60P:90 K (kg/ha)

Year	Area (ha)	No. of farmers	Yield q/ha			Increase over control plots(%)	Technology gap (q/ha)	Extension gap (q/ha)	Technology Index (%)
			Potential	Trial (Controller Fungicide)	Control plots (Chemical Fungicide)				

2023 –24	4	16	375	325	302	7.07	50	23	15.38

Table- 2: Production yield and gap analysis of impact of demonstrations on potatocrop

Table- 3: Yield parameters under demonstrations and existing farmers practice.

Yield parameters	**Demonstration plots**	**Control plots**
Tuber Weight (g)	100.50-140.90	80.50 -120.50
Yield Per Hectare (t/ha)	30 – 34	25 – 30

Table-4: Economic analysis of demonstrated plots and control plots

Year	**Average cost of cultivation (Rs/ha)**		**Average gross return (Rs./ha)**		**Average net return (Rs./ha)**		**B : C ratio**	
	Trial (Controller fungicide)	Control plots (Chemical fungicides)	Trial (Controller fungicide)	Control plots(Chemical fungicides)	Trial (Controller fungicide)	Control plots (Chemical fungicides)	Trial (Controller fungicide)	Control plots (Chemical fungicides)
2023-24	102300	96320	682500	577500	580200	481180	5.67	5

REFERENCES

Akbar, M. F., Haq, M. A., Yasmin, N., & Khan, M. F. (2012). Management of potato leaf hopper (Amrasca devastans Dist.) with biofungicides in comparison with conventional fungicides on autumn potato crop. Pakistan Journal of Zoology, 44(2).

Anonymous (2011). *Agricultural Studies Division, Directorate of Economics and Statics*, Department of Agriculture and Cooperation, U.P. India.

Choudhary, B. N. (1999). *Krishi Vigyan Kendra – A Guide for KVK Managers*, Publication, division of Agricultural Extension, ICAR, 73 – 78.

Ehiobu, J., Idamokoro, E., & Afolayan, A. (2022). Biofungicides for improvement of potato (Solanum tuberosum L) production. Scientifica, 2022 (1), 1405900.

Mbuyisa, Siphokuhle and Bertling, Isa & Ngcobo, Bonga Lewis. (2023) Foliar Application with Plant-Derived Extracts Enhances Growth, Physiological Parameters, and Yield of Potatoes (*Solanum tuberosum* L.). 34. 10.3390/IECAG2023-15385.

Pradip, Pagaria (2015) Role of front line demonstration on transfer of potato production technologies in Barmer district of Rajasthan. *Agriculture Update*, 10(3) : 245 – 248.

Samui, S. K., S. Mitra, D. K. Roy, A. K. Mandal and D. Saha (2000). Evolution of front line demonstration on groundnut. *J. Indian Soc. Coastal Agric. Res*., 18 (2) : 180 – 183.

Singh, Jagmohan, B. S. Dhillon, Astha and Parvindar Singh (2012). Front line demonstration. An effective tool for increasing the productivity of summer potato in Amritsar district of Punjab. *Asian J. Soil Sci.*, 7(2) : 315 – 318.

Yadav, V. P. S., R. Kumar, A. K. Deshwal, R. S. Raman, B. K. Sharma and S. L. Bhela (2007).Boosting pulse production through frontline demonstration. *Indian Res. J. Extn. Edu.*,7 (2&3).