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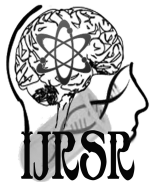
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RESEARCH ARTICLE

A STUDY ON ORGANIC PRODUCTION PRACTICES BEING FOLLOWED BY ORGANIC POTATO GROWERS IN BELAGAVI DISTRICT OF KARNATAKA

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ABSTRACT

A study on organic production practices being followed by organic potato growers in Belagavi district of Karnataka. The primary data were collected from 60 organic potato growers through structured questionnaire method for the study. It was found that cent per cent of the farmers prepared their land to fine tilth by deep ploughing and harrowing 2-3 times. There were high per cent of the farmers (81.67%) per cent were found to be select the tubers from certified organic farms having at least two buds which weigh around 35-40 g for planting. Majority of the respondent farmers (80.00%) were used to treat the tubers with trichoderma solution at the rate of 4 kg/50 litre of water for 10 minutes before sowing. that there were cent per cent of the respondents applying the recommended rate of farm yard manure (8-10 t/acre) in the cultivation of the organic potato crop. In the other hand there were 95.00 per cent of the farmers applied vermicompost at the rate of 1 - 1.5 t/acre to the potato crop. 81.66 per cent of the farmers using Azospirillum at the rate of 1-2 kg/acre for the soil application. 66.66 per cent of the farmers noticed that used phosphate solubilizer at the rate of 1-2 kg/acre for soil application. There were high per cent (93.33%) of the farmers practiced crop rotation with non-host crop for breaking the life cycle of insects and pests. high per cent of the farmers (96.66%) noticed that practicing seed or tuber treatment with Trichoderma @ 4kg per 50 liter of water. majority of the farmers (83.33%) use the method of haulm chopping. Cent per cent of the farmers found to grade their produce as per recommended (small, medium and large size). 90.00 per cent of the respondent farmers were getting the yield of organic potato around 20-25 t/acre.

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INTRODUCTION

Green revolution technologies, supported by policies, and fuelled by agrochemicals, mechanization and irrigation, are well known to have enhanced agricultural production and productivity. While these technologies have greatly helped to developing countries to address their food – security needs, they also impacted the ecosystem due to use of pesticides, excessive use of chemical fertilizers, mono cropping, and loss of microbial flora resulting in loss of sustainable produce. Farmers using these technologies have to dependent on external inputs like chemical fertilizers and pesticides which constitute the major cost of vegetable production, there by eroding their profits. The manufacture of fertilizers and pesticides, the two major inputs of green revolution technologies, need fossil fuels and / or expensive energy, and is associated with serious environmental and health issues.

Organic farming has emerged as an important priority area globally in view of the growing demand for safe and healthy

food and concerns on environmental pollution associated with the indiscriminate use of agro – chemicals. Though the use of chemical inputs in agriculture is invertible to meet the growing demand for food in India, there are opportunities in selected vegetables and niche areas where organic production could be encouraged to tap the domestic and export markets. Keeping this in view, the government of India initiated the National Programme on Organic Production (NPOP) in tenth five year plan under which many promotional and policy initiatives were taken up.

Karnataka is first pioneer state in India to frame an organic policy in 2004. Its potential for organic farming lies with its abundant natural resources in terms of soil types spread across ten agro climatic zones, great number of small and marginal farmers especially in dry farming regions & hilly region. Realizing these needs for the state of Karnataka, International Competence Centre for Organic Agriculture (ICCOA) along with Department of Agriculture / Horticulture conducted many international & national conference, seminars and trainings to farmers, stake holders, private organizations, certifying

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agencies, Organic input manufacturers, exporters and students etc. for promoting organic farming. Potato (*Solanum tuberosum* L.) popularly known as “The king of vegetables” and Indian vegetable basket is incomplete without potato. Potato is nutritionally superior vegetable due to its edible energy and edible protein. It has become an integral part of breakfast, lunch and dinner among the larger population. Karnataka is one of the important potato growing states in peninsular India. Potato is predominantly grown in Bangalore, Belagavi, Dharwad and Hassan districts,

Table 1 Adoption of agronomic practices by organic vegetable growers in Potato (N = 60)

Sl. No	Practices	Potato	
		Number	Percentage
1	Prepare the land to fine tilth by deep ploughing and harrowing around 2-3 times	60	100.00
2	Sowing type (Ridges and Furrows Method)	60	100.00
3	Sowing Season		
a.	Kharif (June-July)	48	80.00
b.	Rabi (Oct-Nov)	12	20.00
c.	Summer (March-April)	0	0
4	Variety selection – Seeds / tubers should be resistant to pest and disease i.e Kufri- Jyothi and Kufri – Jawahar.	53	88.33
5	Tuber / Seeds should be selected from certified organic farms having at least two buds which weigh around 35 – 40 g for planting.	49	81.67
6	Seed/Tuber rate @4-6 qtl / acre with viable sprouting buds	54	90.00
7	Seed / tuber treatment / dipping with Trichoderma solution @ 4 Kg / 50 litre of water for 10 minutes before sowing.	48	80.00
8	Practice of incorporation of crop residues in the ridges	45	75.00
9	Spacing between Rows (50-60 Cm) and Plants (20-25 Cm)	52	86.66
10	Cropping Pattern		
a.	Sole Cropping	56	93.33
b.	Inter Cropping with tomato / cucumber at the time of potato flowering.	4	6.66
11	Irrigation requirement around 5-8 times at every 6-9 days interval, because it is most sensitive to water deficit	47	78.33
12	Practices of Mulching by sugarcane trash / jawar straw etc to maintain the optimum moisture	25	41.66

Review of Literature

Rajendra Chopke (2000) conducted study in Akola district of Maharashtra state, 85.40 per cent of farmers were medium adopters of Bio Control measures whereas only 8.00 per cent of the respondents were noticed in high adoption category and only 6.56 per cent were low adopters of Bio-Control measures. Thimmareddy (2001) in case study of ten farmers conducted on organic cultivation of field crops reported that 90.00 per cent of the respondents were using farmyard manure for crop production followed by 70.00 per cent of the respondents were applying plant extracts for pest and disease control. The practice of green manuring, vermicompost and mulching was noticed among 50 and 40 per cent of the respondents respectively. Lastly the practice of compost, vermiliquid and sheep penning was noticed with 30% and 20% of the respondents respectively.

Ramesh and Shantha (2002) reported in a study on extent of adoption of organic farming practices in Pudukotti district of

Tamil Nadu, high majority of the respondents were found to adopt the practices like in situ incorporation of crop residue (98.00%), followed by application of neem oil cake (96.00%). Application of green leaf manure (95.00%), spraying of leaves extract (92.00%) and application of farm yard manure and providing owl perch (90.00%). Application of compost (80.00%), use of Azospirillum (70.00%) collection and destruction of egg larvae and pupa of pests (67.00%) and application of vermicompost (62.00%) were the other adopted practices. Use of light traps and recommended crop rotation were noticed with 45.00 per cent and 43.00 per cent of respondents respectively.

Table 2 Adoption of soil fertility management practices by organic vegetable growers in potato (N = 60)

Sl. No.	Practices	Potato	
		Number	Percentage
1	Application of organic manures		
a	Apply Farm Yard Manure 8 – 10 t / acre	60	100.00
b	Apply vermi – compost 1 – 1.5 t / acre	57	95.00
2	Application of Green manuring		
a	Green manuring – dhaincha, sunhemp etc	51	85.00
b	Green leaf manuring – Gliricidia and Pongamia glabra etc	42	70.00
3	Practices of FYM can be treated with Trichoderma@ 1-2 Kg / 100 Kg of FYM	56	93.33
4	Apply neem cake @ 250 Kg / acre while forming ridges.	47	78.33
5	Application of Bio – fertilizers		
a	Application of Azospirillum @1-2 Kg /acre soil application	49	81.66
b	Application of Phospet Sulbalizers @ 1-2 kg/acre soil application	40	66.66
6	Application of Jivamrutha @ 3-5 lit / 100 lit of water for spraying over soil.	45	75.00
7	Maintain optimum soil moisture to avoid leaching and mobility of nutrients	25	41.66
8	Incorporation of crop residues like sugar cane straw/ Jawar straw /Soybean etc in the soil to enrich the soil	20	33.33

Anwer *et al.* (2010) conducted field experiment on influence of varying adoption of organic sources of nutrient on growth and yield of coriander was conducted at NRCSS, Ajmer during rabi season of 2003, 2004 and 2005. The experiment comprising of absolute control, three levels of sheep manures (5.0, 7.5 and 10.0 t/ha), vermi-compost (2.0, 3.0, and 4.0 t/ha) and recommended dose of fertilizer with and without bio-fertilizer was laid in randomized block design with three replications. The organic sources of nutrients were applied one month before sowing and coriander seeds were inoculated with Azotobacter and sown after drying in shade. Based on three year study it was found that all organic and inorganic sources of nutrients with and without bio-fertilizer proved superior and exhibited higher yield over absolute control. Application of bio-fertilizer as sole as well as in combination with sheep manure, vermi compost and recommended doses of fertilizer resulted higher growth, yield attributes and yield over absolute control. The association of bio-fertilizers with all sources of nutrients proved beneficial and resulted higher growth and yield over without bio-fertilizer. Application of 7.5 t/ ha sheep manure with biofertilizer resulted highest growth and yield attributes as well as seed yield over respective lower and higher levels but increasing level of vermi-compost with and without biofertilizer (2.0, 3.0 and 4.0 t/ha) exhibited higher growth and

yield over their respective lower levels. Thus, it is inferred that application of 7.5 t/ha sheep manure is better for realizing higher yield, net return and BCR under lower fertile soil with respect to available nitrogen.

Table 3 Production practices being followed in management of pest and diseases by organic vegetable growers in Potato. (N = 60)

Sl. No.	Practices	Potato	
		Number	Percentage
I	Major Pest and Disease observed		
1	Major Pest observed – Cutworms, Shoot borer and Aphid.	57	95.00
2	Major disease observed – Blight, Fusarium Dry Rot, Black Scurf (Rhizoctonia Solani).	55	91.66
II	Cultural Practices		
1	Deep summer ploughing for exposing the eggs and immature stages of pest and insects to high temperature and predatory birds.	60	100.00
2	Crop rotations with non- host crop for breaking the life cycle of insects and pests	56	93.33
3	Use of trap crop like marigold to attract shoot borer and cutworms etc	58	96.66
4	Timely sowing of entire block	52	86.66
III	Mechanical Practices		
1	Mechanical removal of infested shoots / plants	42	70.00
2	Light traps installed in / around potato fields attract the pests	45	75.00
3	Uprooting of alternate host plants	51	85.00
4	Collection and destruction of egg masses/larva	35	58.33
5	Installation of pheromone trap around 4 – 6 per acre	48	80.00
6	Conservation and encouraging of predators in the field	45	75.00
IV	Use of Bio – Pesticides / Fungicides		
1	Seed / tuber treatment / dipping with Trichoderma @ 4 Kg / 50 litre of water	58	96.66
2	Release of Trichocard (Trichogramma chilonis) @ one card / acre at weekly interval of 3 to 4 times after noticing the pest (Shoot borer).	46	76.66
3	Spray of Bacillus subtilis @ 5 g / litre of water on the crop and ridges to control the late blight	33	55.00
4	Spray Neem Seed Kernel Extract (NSKE)5% at 45 days after sowing (DAS) to control pest and disease	46	76.66
5	application of neem cake to the soil to control nematodes/root disease (2-4qtl /acre)	52	86.66

Justification or Importance of The Study

Conventional potato growing vegetable farmer are now gradually shifting back to organic potato cultivation in India. It is believed by many that organic farming is healthier. Though the health benefits of organic food are yet to be proved, consumers are willing to pay higher premium price for the same. Many farmers in India are shifting to organic potato cultivation due to the domestic and international demand for organic potato. In this background, the government have been framed and implementing several policies and programmes encouraging organic vegetable farming programme in place of conventional farming. At present there is no adequate and proper documentation of organic potato production practices being adopted by organic potato growers in Karnataka.

Table 4 Adoption of Weed Management practices by organic vegetable growers in Potato (N = 60)

Sl. No.	Practices	Potato	
		Number	Percentage
1	Practicing of inter cultivation at 20 and 45 days after sowing (DAS) and 2 times hand weeding at 25 and 50 DAS.	58	96.66
2	Practice of crop rotation and cover crop to suppress the weed germination.	51	85.00
3	Practice of mulching the soil surface can prevent weed germination by blocking light transmission.	44	73.33
4	Practices of field scouting to make immediate weed management decisions to reduce crop yield.	29	48.33
5	Careful selection of crop varieties to grow more rapidly than the weeds	25	41.66
6	Practice of keeping field bunds free from weeds	47	78.33
7	Practice of soil solarisation (by exposing soil to sunlight)	49	81.66

Table 5 Adoption of Pre and Post-harvest management practices by organic vegetable growers in Potato (N = 60)

Sl. No.	Practices	Potato	
		Number	Percentage
I	Pre –Harvest Management		
1	Methods of Haulm Removal		
a	Haulm chopping	50	83.33
b	Haulm pulling	10	16.66
c	Flaming	0	0
2	Stop irrigation 2 to 3 weeks before harvest	60	100.00
3	Harvest the crop after 10-15 days haulm cutting/De - haulming	60	100.00
II	Post – Harvest Management		
1	Method of digging		
a	Hand digging	11	18.33
b	Ploughing by bullock pair / Tractor	49	81.66
2	Drying and Curing		
a	Dry the harvested tubers quickly to remove excessive moisture from the surface of the tuber.	47	78.33
b	Curing the crop at 25 degree centigrade with a 95% of relative humidity.	22	36.66
3	Practice of removing all damaged and diseased tubers during sorting	58	96.66
4	Methods of Grading		
a	Grading by hand	44	73.33
b	Grading by grader	16	26.66
5	Size of grading should be – Small, Medium and Large	60	100.00
6	Method of Packing		
a	Jute Bags	47	78.33
b	Bamboo Baskets	11	18.33
c	Plastic crates	2	3.33
7	Mode of Transport		
a	Tempo / Trucks	38	63.33
b	Bullock cart	10	16.66
c	Tractor	12	20.00
8	The yield of organic Potato around 20-25 t / acre.	54	90.00

Objective of The Study

O study the organic production practices being followed by organic potato growers

METHODOLOGY

Research Design

The research design adopted for this study was ex-post-facto technique, since the phenomenon has already started and is continuing. An Ex-post-facto research design is the most

systematic empirical enquiry in which the researcher does not have direct control over independent variables as their manifestation has already occurred or as they are inherent and not manipulatable. These inferences about relations among variables were made without intervention from concomitant variation of dependent and independent variables. The present study was conducted in Belagavi district of Karnataka. Primary data were collected from 60 organic potato growers through structured questionnaire method at Belagavi district of Karnataka. The collected data was tabulated and analysed by using frequency and percentage.

RESULT AND DISCUSSION

The Table 6.1 depicted that there were cent per cent of the farmers prepare their land to fine tilth by deep ploughing and harrowing around 2-3 times and their sowing type was found to be ridges and furrow method. There were 80.00 per cent of the farmers whose sowing season was found to be in Kharif followed by 20 percent farmers found to be sow in the rabi season. It was noticed that 88.33 per cent of the farmers were select the varieties of tubers or seeds resistant to the pest and disease. The pest and disease resistant varieties were found that Kufri Jyothi and Kufri Jawahar. There were high per cent of the farmers 81.67 per cent were found to be select the tubers from certified organic farms having at least two buds which weigh around 35-40g for planting. 90.00 per cent of the farmers were found to be use recommended tubers at the rate of 4-6qtl/acre with viable sprouting buds. Majority of the respondent farmers (80.00%) were used to treat the tubers with trichoderma solution at the rate of 4kg per 50 liter of water for 10 minutes before sowing. 75 per cent of the farmers practicing incorporation of crop residues in the ridges. 86.66 percent of the farmers found to be maintaining spacing between rows (50-60cm) and plants (20-25cm). In case of cropping pattern 93.33 percent of the farmers expressed that practicing sole cropping and only 6.66 percent followed intercropping with tomato / cucumber at the time of potato flowering. 78.33 percent of the farmers practiced irrigation around 5-8 times at every 6-9 days interval, because it is most sensitive to water deficit. 41.66 percent of the respondent farmers expressed that practice of mulching by sugarcane trash / jawar straw etc to maintain optimum moisture.

Application of Organic Manures in Potato

The Table 6.2 shows that there were cent per cent of the respondents applying the recommended rate of farm yard manure (8-10 t / acre) in the cultivation of the organic potato crop. In the other hand there were 95.00 per cent of the farmers applying vermicompost at the rate of 1 - 1.5t/acre to the potato crop.

Application of green manuring in potato

It was noticed that 85.00 per cent of the farmers were applying green manure like dhaincha, sunhemp etc. to the potato crop. The green leaf manure was applying by 70.00 per cent of the respondents. There were 93.33 per cent of the farmers practicing farm yard manure with recommended dose of

Trichoderma @1-2 kg/100kg of FYM. 78.33 per cent of the farmers were applying neem cake at the rate of 250 kg per acre while forming ridges.

Application of Bio fertilizers in potato

There were 81.66 per cent of the farmers using Azospirillum at the rate of 1-2 kg/ acre for the soil application. 66.66 percent of the farmers noticed that using Phosphate Solubilizer at the rate of 1-2 kg/acre for soil application. It was noticed that 75.00 per cent of the farmers used to apply Panchagavya at the rate of 3-5 liter/ 100 liter of water for spraying over soil. There were 41.66 per cent of the respondents maintaining optimum soil moisture to avoid leaching and mobility of nutrients. 33.33 percent of the farmers followed that practices of incorporation of crop residues like sugar cane straw/ soybean etc. in the soil to enrich the soil fertility. Table 6.3 that 95.00 per cent of the farmers field noticed that major pest like cut worms, shoot borer and aphids in their potato filed. 91.66 per cent of the farmer's feild observed that major diseases like blight, Fusarium dry rot, black scurf (*Rhizoctoniasolani*) in the potato filed.

Cultural Practices in Potato

All respondent farmers were practicing the deep summer ploughing for exposing the eggs and immature stages of pest and insects to high temperature and predatory birds. There were high per cent (93.33%) of the farmers practicing crop rotation with non-host crop for breaking the life cycle of insects and pests. There were 96.66 per cent of the farmers practicing use of trap crop like marigold to attract shoot borer and cut worms etc. in the other hand there were 86.66 per cent of the farmers used to sow entire block in time.

Mechanical practices in potato

It was noticed that 70.00 per cent of the farmers were practicing mechanical removal of the infested shoots or plants. There were 75.55 per cent of the respondent farmers followed practices to install the light traps in and around the potato field to attract the pests. 85.00 per cent of the farmers were following practices of uprooting of the alternate host plants. There were 58.33 per cent of the farmers used to collect and destruct the egg masses or larva from the potato filed. It was observed that 80.00 per cent of the farmers were following practices of installation of pheromone trap around 4-6 per acre of the potato filed. There were 75.00 per cent of the farmers conserving and encouraging of predators in the field.

Use of Bio pesticides in potato

There were high per cent of the farmers (96.66%) noticed that practicing seed or tuber treatment with Trichoderma @ 4kg per 50 liter of water. There were 76.67 per cent of farmers found to be practicing release of trichocard at the rate one card per acre at weekly interval of 3-4 times after noticing the pest like shoot borer. 55.00 per cent of the farmers found to practicing spray of *Bacillus subtilis* at the rate of 5g per liter of water on the crop and ridges to control the late blight. There were 76.67 per cent of the farmers used to spray Neem Seed Kernel Extract

(NSKE) 5% at 45 days after sowing (DAS) to control pest and disease. The high per cent of the respondents (86.66%) used to apply the neem cake to the soil to control nematodes or root disease at the rate of 2-4qtl per acre of the potato crop field.

Table 6.4 revealed that adoption of Weed Management practices by organic vegetable growers in Potato. There were 96.66 per cent of the farmers found to be practices of inter cultivation at 20 and 45 days after sowing and 2 times hand weeding at 25 and 50 days after sowing. 85.00 per cent of the farmers were following practices of crop rotation and cover crop to suppress the weed germination in the potato crop field. It was found that 73.33 per cent of the respondent farmers practices of mulching of the soil surface to prevent the weed germination by blocking light transmission. It was noticed that 48.33 per cent of the farmers used to do field scouting to make immediate weed management decisions. There were 41.66 per cent of the farmers used to select the varieties carefully to grow more rapidly than the weeds. There were 78.33 per cent of the farmers were following practices of keeping the field bunds free from weeds. There were 81.66 per cent of the farmers were following practices of soil solarisation by exposing soil to sunlight.

Pre-harvest management in potato

Methods Of Haulm Removal In Potato

The data depicted in the Table 6.5 revealed that majority of the farmers (83.33%) use the method of haulm chopping followed by haulm pulling (16.66%) and no one followed flaming method. cent per cent of the farmers found to stop their irrigation 2-3 weeks before harvesting of the potato crop and also it was found that all the farmers used to harvest their crop after 10-15 days of haulm cutting or de-haulming process.

Post-harvest management in potato

There was 18.33 per cent of the farmers were following practices of hand digging method. There were 81.66 per cent of the farmers were following practices of ploughing by bullock pair or tractor. High per cent of the farmers (78.33%) were following practices of drying the harvested tubers quickly to remove excessive moisture from the surface of the tuber. There were 36.66 per cent of the farmers used to cure the crops at 25 degree centigrade with 95% of relative humidity. It was noticed that 96.66 per cent of the farmers practicing of removing all damaged and diseased tubers during sorting.

Methods Of Grading In Potato

Cent per cent of the farmers found to grade their produce as per recommended (small, medium and large size). There were 73.34 per cent of the farmers used to grade the potato by hand whereas rest of the 26.66 per cent of the farmers used to grade the potatoes by using grader.

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Method Of Packing In Potato

Majority of the respondents (78.33%) were practicing the packing of the potatoes by using jute bags. 18.33 per cent and 3.33 per cent of the farmers noticed that used Bamboo basket and plastic crate for packing the potatoes.

Mode of transport

High per cent of the respondent farmers (63.33%) expressed that transport their produce through tempo or trucks for the market their produce followed by 16.66 per cent through bullock cart and 20.00 per cent of the farmers through tractor. It was noticed that 90.00 per cent of the respondent farmers getting the yield of organic potato around 20-25t per one acre of the land.

CONCLUSION

India had developed a vast and rich traditional agricultural knowledge since ancient times and presently finding solutions to problems created by over use of agrochemicals. Today's modern farming is not sustainable in consonance with economics, ecology, equity, energy and socio-cultural dimensions. Indiscriminate use of chemical fertilizers, weedicides and pesticides has resulted in various environmental and health hazards along with socio-economic problems.

Governments have begun to recognize the possibility that it may be cheaper to support organic agriculture than to rectify problems associated with certain resource-destruction production practices. For this reason, several governments have introduced subsidies for organic agriculture. These subsidies come in many forms, such as direct payments to farmers (both for those in the conversion stage and also for established organic farmers), and indirect aid (such as for education, research, extension and marketing).

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