Extent of Awareness and Adoption of Bio Agents in Vegetable Production in Kerala

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Abstract

Vegetable cultivation is the main stay of a large number of small and marginal farmers and landless agricultural workers in Kerala. They face a number of constraints in production and marketing. The most important production risk occurs by way of losses caused by pests and diseases. The establishment of vegetable research infrastructure in the State Agricultural Universities has led to the development of a number of improved production, protection, value addition and post-harvest technologies. This paper attempts to measure the extent of awareness and adoption of biological agents in crop protection in vegetables, specifically in cucurbits, by the farmers of Kerala. Biological agents like Pseudomonas fluorescence, trichoderma viridae, Beauveria bassiana, Metarhizium and Verticillium lecanii have been proved to be very effective in the control of pests/diseases. PGPR Mix 1, PGPR Mix 11, Fish jaggery extract, Panchagavyam, Vermicompost, Vermiwash are very effective growth promoters. Pheromone traps are also very effective in control of pests. The increase in the sale of vermicompost and earth worms for composting shows that the farmers have successfully adopted the application of this technology for recycling of farm wastes in their field. Sale of Pheromone traps, Pseudomonas fluorescence and Trichoderma viridae has also increased substantially. However, there is no appreciable increase in the sale of the other biological agents. More awareness creation among farmers through field demonstrations and on-farm trials are necessary to bring farming to an organic path.

Keywords: biological agents, demonstration, on farm trials, production risk, research

I. INTRODUCTION

The value of the global market for bio-pesticides is projected to reach USD 6.60 billion by 2010 at a compound annual growth rate of 18.8 per cent from 2015 to 2020[1]. Various biological agents which help in pest and disease control as well as promote plant growth are available in the market[2] and their demand is going up day by day consequent to the increasing food safety, ecological and environmental concerns. The Government of Kerala has also placed considerable thrust on safe to eat products and is in a drive to promote organic farming in the State. In the wake of climate change and change in cropping pattern with an emphasis on intensive monocultures, newer and newer pests and diseases are being reported. Several hazardous chemicals have been banned from use in crop fields and farmers as well as scientists are in search of alternatives which are less harmful to humans and the environment.

A large number of small and marginal farmers and landless agricultural workers in Kerala depend on vegetable cultivation for their livelihood. Even though vegetable research in Kerala gained momentum during the eighties only, considerable work has been done on crop improvement, production, protection and post-harvest handling of various tropical vegetables. In Kerala cultivation of a variety of vegetable crops differing in temperature requirement, cultivation practices etc is carried out due to the diverse climatic conditions prevailing in different parts of the state. Amaranthus, bitter gourd, snake gourd, bhindi, brinjal, cucurbits, drumstick, green chillies etc. are the important vegetables cultivated in Kerala. Cool season vegetables which were grown in the districts of Idukki, Wayanad and high altitude villages of Palakkad district are now being cultivated in the plains also, thanks to the availability of new varieties suitable to the Kerala climate. An added thrust has been placed on vegetable cultivation by the Government of Kerala consequent to reports on pesticides residues in vegetables. Reports from the Pesticides Residue Laboratory of the Kerala Agricultural University indicate residues higher than the permissible levels in most of the vegetables available in the markets[3,4]. The residue levels were very high in curry leaf, green chilli, yard long bean, cabbage etc. Kerala Agriculture University has come out with several organic techniques for production of vegetables as well as other crops. This paper analyses the extent of adoption of various biological agents in vegetable production and the reasons for non-adoption/partial adoption.

II. METHODOLOGY

The study was conducted based on both primary and secondary data on technology generation and field level adoption of technologies/varieties evolved out of research of Kerala Agricultural University. A reconnaissance survey was conducted to gain preliminary insights into the adoption of production technologies and constraints farmers faced in vegetable cultivation. This was followed by the collection of secondary data and discussions with officials of the Directorate of Research, Kerala Agriculture University (KAU), scientists of KAU and other research institutes and representatives from VFPCK and the State Department of

Agriculture. The list of vegetable growers from the five districts of Kerala namely Trivandrum, Kollam, Thrissur, Ernakulum and Palakkad, especially those growing all the three cucurbits, viz., bittergourd, snakegourd and cucumber were collected from the VFPCK district offices. From this list a total of 24 farmers were randomly selected from each district to form a sample of 120 farmers for the study.

III. RESULTS

A. Constraints in Vegetable Production:

The farmers in Kerala face a number of constraints in the production of vegetables. The most important problems in the production of vegetables were losses due to insect- pest incidence, non-availability of quality seeds, inadequate irrigation facilities, high variations in yield, lack of suitable location specific varieties etc. The production risks are high, primarily because of considerable production losses caused by pests. The post-harvest losses are also quite high due to their perishable nature. The high volume and perishability of vegetables posed several problems in their marketing. Other problems included lack of market intelligence, price risks, delayed sale and payment, lack of processing and high cost of packaging materials etc. The growing population and their improving economic status are causing rapid growth in demand for vegetables all over the country. The establishment of vegetable research infrastructure in the State Agricultural Universities has led to the development of a number of improved production, protection, value addition and post-harvest technologies.

The major constraints in vegetable production as listed by the respondent farmers are given in Table 1. Non availability of good quality seeds, non-availability of fertilisers in time, high cost of plant protection chemicals, high cost and non-availability of labour were the problems listed by majority of farmers.

Table – 1
Major constraints in vegetable production in Kerala (expressed as Percentage)

Constraints	*Snake gourd*	*Bittergourd*	*Cucumber*
Seeds			
Impure seeds	*21*	*19*	*17*
Non-availability of quality seeds	*76*	*64*	*54*
Fertilizers			
High cost of fertilizers	*68*	*43*	*41*
Non-availability of required fertilizers at proper time	*74*	*49*	*42*
Plant protection measures			
Lack of awareness	*21*	*23*	*16*
High cost of plant protection chemicals	*51*	*41*	*54*
Adulterated plant protection chemicals	*42*	*31*	*29*
Others			
Lack of regulated marketing facilities	*71*	*67*	*58*
Non-availability of timely labour and high cost of labour	*89*	*63*	*61*
Price fluctuation	*37*	*52*	*41*
Lack of irrigation facilities	*41*	*52*	*43*
Poor texture of soil	*32*	*31*	*37*

B. Pest Management in Vegetables – Non Chemical Methods:

A significant proportion of potential production is lost due to insect pests, diseases and weeds. Owing to continued increasing incidence of these biotic stresses, the use of chemical pesticides has increased many folds. Kerala Agriculture University has made significant contributions in the field of non-chemical interventions in pest and disease control. One such intervention is bacterial wilt resistance breeding. The wilt resistant varieties like Surya, Swetha, and Haritha (brinjal), Shakthi, Mukthi and Anagha (Tomato), Ujwala, Manjari and Anugraha (Chilli) are a few examples. Neelima (Brinjal), the first hybrid from KAU and also the first hybrid in the country having high resistance to bacterial wilt and high yield is yet another break through. Mosaic resistant vegetable cowpea variety, Kairali, and yellow vein mosaic resistant bhindi variety, Susthira are also major achievements in the field of resistance breeding[5].

With rising public concerns about economic and ecological externalities of the chemical pesticides, the emphasis of plant protection research and development strategies has gradually been shifting from chemical to non-chemical approaches. Among the non-chemical approaches, Integrated Pest Management (IPM) has emerged as one of the important alternatives. It includes application of bio-organism in conjunction with chemical pesticides, agronomic practices and mechanical control. The use of biocontrol agents and bio inputs is an important factor in the integrated pest and disease management approach.

Table – 2
Non Chemical Technologies for pest and disease management[6]

Technology	*Method of application*
Pseudomonas flouresence	*20 gm/litre foliar spray as well as root zone drenching against all fungal diseases as precautionary measure.*
Trichoderma viridae	*1kg Trichoderma mixed with 100 kg organic manure can be applied to crops*

Beauveria	*20gm/litre foliar spray is effective against all crop pests.*
Metarhizium	*20gm/litre foliar spray against coleopteran grubs. Pour metarhizium culture 250gm/750 ml water against rhinocerous beetle.*
PGPR Mix 1	*Apply mixed with 100Kg organic manure*
PGPR Mix 11	*20 gm/litre water foliar spray against fungal diseases*
Fish amino acid	*effective for growth enhancement and as pest repellent (3-5 ml /litre of water)*
Panchagavyam	*3% foliar spray for growth enhancement*
Vermicompost	*Good organic manure. Can substitute 50 % cowdung when used.*
Vermiwash	*Very effective growth promoter when applied as foliar spray after 7-8 times dilution*

Sale of bio control agents and bio inputs from various government agencies in the State has been collected and presented as an indicator of the popularity of these inputs among farmers. An assessment of the sales of biocontrol agents like Pseudomonas , trichoderma and Pheromone traps revealed that the sales has increased considerably over the years (Table 3).The increase in the sale of vermicompost and earth worms for composting shows that the farmers have successfully adopted the application of this technology for recycling of farm wastes in their field to improve the yield.

Table - 3
Sale of bio control agents and bio inputs

Biocontrol agents				*Bio inputs*	
Year	*Psuedomonas (tonnes)*	*Trichoderma (Kg)*	*Pheromone trap (Nos.)*	*Vermicompost (Kg)*	*Earthworm (nos)*
2007-08	*145.44*	*802.72*	---	*214.21*	*155.52*
2008-09	*167.38*	*129.79*	---	*246.46*	*112.82*
2009-10	*133.54*	*201.17*	*1542*	*192.52*	*130.20*
2010-11	*153.63*	*603.85*	*989*	*491.18*	*5031.14*
2011-12	*163.84*	*754.84*	*790*	*25717.00*	*5730.94*

Source: Various government sales outlets.

Although several improved and integrated technologies of pest and disease management in vegetable crops have been developed, their adoption has not been very encouraging. The adoption behaviour of farmers with respect to these practices in bitter gourd, snake gourd and cucumber has been examined, along with the reasons for non-adoption.

Table – 4
Adoption pattern of technologies related to bio control agents and bio inputs by farmers

Sl.No	*Recommended practices*	*Fully adopted*		*Partially adopted*		*Not adopted*		*Total score*	*Mean*	*Rank*
		No	*%*	*No*	*%*	*No*	*%*			
1	*P flouresence*	*54*	*45*	*21*	*18*	*45*	*38*	*64.5*	*0.54*	*V*
2	*T viridae*	*21*	*18*	*52*	*43*	*47*	*39*	*47*	*0.39*	*VIII*
3	*Beauveria*	*42*	*35*	*46*	*38*	*32*	*27*	*65*	*0.54*	*V*
4	*Metarhizium*	*0*	*38*	*06*	*39*	*114*	*23*	*3.00*	*0.03*	*X*
5	*PGPR Mix 1*	*57*	*48*	*63*	*53*	*0*	*0*	*88.5*	*0.74*	*II*
6	*PGPR Mix 11*	*19*	*49*	*11*	*51*	*90*	*0*	*24.5*	*0.20*	*IX*
7	*Fish jaggery extract*	*48*	*40*	*62*	*52*	*10*	*8.3*	*79*	*0.66*	*III*
8	*Panchagavyam*	*36*	*30*	*71*	*59*	*13*	*11*	*71.5*	*0.60*	*IV*
9	*Vermicompost*	*85*	*71*	*35*	*29*	*0*	*0*	*102.5*	*0.85*	*I*
10	*Vermiwash*	*34*	*28*	*32*	*27*	*54*	*45*	*50*	*0.42*	*VII*

It can be seen from the table that maximum adoption was in the case of vermicompost followed by PGPR Mix I. Fish jaggery extract and panchagavyam stood next in the adoption chart.

Reasons for non-adoption of the technologies were explored and it was found that lack of awareness of the technological recommendations and lack of conviction of effectiveness were the reasons suggested by majority of the farmers. The details are presented in Table 5.

Table – 5
Reasons for lack of adoption of bio agents in vegetable production

Reasons	*No of farmers reporting as major problem*	*Rank*
Not aware of the technology	*80*	*I*
Not convinced of result	*53*	*II*
Non availability of input	*45*	*III*

IV. CONCLUSION

The study revealed that research expenditure in KAU has yielded positive and effective results in respect of biological inputs in vegetable production as well as in pest and disease management. However, the extent of adoption of these technologies in the field is only partial mainly due to lack of awareness, lack of farmer confidence in effectiveness of the technologies as well as non-availability of good quality inputs in time. In recent years, especially in the post WTO regime, more emphasis need to be given to the use of eco-friendly pesticides for crop production in view of their less toxic nature and low residue problems[7]. Greater efforts hence have to be taken for increasing farmer awareness on biological inputs in vegetable production and

integrated pest and disease management so as to lessen the use of harmful chemicals in agriculture and to pave way for organic agriculture and safe to eat food in the State.

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