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Implementation of Basmati Rice IPM Technology among Rice Growers of District Gautam Buddha Nagar, Uttar Pradesh under Farmer Participatory Approach

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A B S T R A C T

Rice is being the staple food and primary source of nourishment for larger part of the human populace assumes a vital part in the Indian economy and employment. Basmati Rice is a long-grain aromatic rice grown in several parts of Indian and Pakistan. India is the leading exporter of the Basmati rice to the global market and cultivated in about 2.0 million hectares. Findings of conducted surveys revealed excessive and injudicious use of chemical pesticides and fertilizers by farmers that aggravated the pest menace, secondary pest outbreaks, residue problems in grains, soil and water, environmental degradation and rejection of many export consignments. Nonetheless, current High Yielding Varieties (HYVs) were created and presented during the mid-1960s which could adapt up to a scope of biotic and abiotic stress. Further, the farmers began facing challenges in production of Basmati rice due to pest problems in Western region of Uttar Pradesh especially Gautam Buddha Nagar, Uttar Pradesh. Numerous pest attack damage estimated up to about 20-50% yield losses. There is significant development in researching new eco-friendly pest management practices by the IPM scientists on farmer field through farmer participatory approach. No doubt, all these technologies really brought out significant increase in productivity in rice. Each technology developed by the scientists in this area had its own contribution as sole and also in combination with different technologies, all technologies, special focus on Integrated Pest Management (IPM) is required as it is the central pole for all the technological developments. Hence, IPM should be treated as a yardstick for the productivity of a crop and a scientific paradigm which is now of global significance. Basmati rice growers of Bambawad district Gautam Buddha Nagar (Uttar Pradesh) are handling pest problems in sustainable manner with the adoption of Basmati Rice IPM practices which had proven worthy and promising IPM practices.

Keywords: Basmati Rice, Integrated Pest Management, Technologies, Implementation, High Yielding Varieties

Introduction

Rice is being the staple food and primary source of nourishment for larger part of the human populace assumes a vital part in the Indian economy and employment. Basmati Rice is a long-grain aromatic rice grown in several parts of Indian and Pakistan. India is the leading exporter of the Basmati rice to the global market and cultivated in about 2.0 million hectares. Nonetheless, current High Yielding Varieties (HYVs) were created and presented during the mid-1960s which could adapt up to a scope of biotic and abiotic stress. Further, the farmers began facing challenges in production of Basmati rice due to severity of pest problems in Western region of Uttar Pradesh especially Gautam BuddhaNagar, Uttar Pradesh. Numerous pest attack damage estimated up to about 20-50% yield losses. To overcome pest problems in Basmati Rice in sustainable manner advancement of appropriate Integrated Pest Management (IPM) methodology is significant. For fostering a fruitful IPM plan, it is crucial for now the farmer's conventional pest management practices and knowledge of pests and natural enemies in a rice based cropping system. An environment level comprehension of pest life cycles develop the premise to fruitful plan and implementation of an IPM methodology. The essential and prime aim of the National IPM program is to secure the quality and sustainable production of Basmati Rice. An effective IPM plan represents the adoption of good agricultural practices and eco-friendly pest management with involvement of farming communities and IPM stake holders.

The NCIPM, New Delhi has generated Basmati Rice IPM technologies with farmer participatory approach. The farmers were benefitted for an enormous scope by the immense scope reception of IPM in rice agro-environment.

Its basic concern is to design and implement pest management practices that meet the objectives of farmers, consumers and governments to reduce pest losses while preventing environmental pollution, human health hazards, and long-term risks of agricultural reduction.

Sustainability an interdisciplinary and inter-institutional team accepted NCIPM's challenges and solved these problems through an overall IPM strategy. IPM strategies were synthesized, validated and promoted in the village Bambawad district Gautam Buddha Nagar, Uttar Pradesh.

Biotic Constraints

Major Insects Pests: National Significance

- Yellow stem borer
- Brown Plant hopper
- Leaf folder
- Gundhi bug
- Gall midge

Major Diseases: National Significance

- Rice blast
- Bacterial leaf blight
- Sheath blight
- False smut
- Brown spot

Major Nematodes: National Significance

- Root Knot nematode
- White tip nematode

Major Weeds: National Significance

- Weedy rice
- Cyperus rotundus (L.)
- Echinochloa crusgalli (L.) (Beauv)

IPM Approache

There are various meanings of IPM gave by government, research association, NGOs and Universities. IPM is framework that, with regards to the related climate and the populace elements of pests, use every one of the practical strategies and techniques in a viable way as could be expected and keeps up with the populace at levels below those causing losses. IPM should be treated as a yardstick for the productivity of a crop. Perkins (1982) stated Integrated Pest Management (IPM) is a scientific paradigm which is now of global significance. Its basic concern is with designing and implementing pest management practices that meet the goals of farmers, consumers and governments in reducing pest loses while, at the same time, safeguarding against the longer term risk of environmental pollution, hazards to human health and reduced agricultural sustainability. An inter-disciplinary and inter-institutional team took up the challenge at NCIPM to address these problems through holistic IPM tactics. IPM strategies were synthesized, validated and promoted in the village Bambawad district Gautam Buddha Nagar Uttar Pradesh.

Accordingly IPM is the best blend of social, organic and substance estimates that gives the most practical, naturally strong and socially adequate technique for overseeing infections, bugs, weeds and different nuisances.

The Basmati rice IPM module developed by the NCIPM multidisciplinary team was used for rice pest management and was found to be very effective in reducing the incidence of pests and diseases in the Bambawad village that adopted the IPM plan. Some of the farmers of the area were very happy for IPM programme. There is immense scope for proven Basmati Rice IPM technologies in India to sustainable pest management, quality production, reduction of chemical consumption and enhancing farmers' income and empowerment The adoption of IPM technologies is always a great challenge to the researches and scientists.

Adoption of IPM is very complex in nature and influenced by the socio-economic, cultural, marketing, access of IPM information availability of IPM information and advisory services, training and timely availability of critical inputs, extension support services and availability of proven IPM technologies and policy support.

IPM is also knowledge intensive need specific extension approaches and intensive training. The adoption of IPM depends on the coordination of all the IPM stakeholders. The involvement of local community for in IPM also very important because of IPM is community approach because IPM will not impact in isolation like other technologies. Therefore the involvement of farming community, school, social institution for environmental awareness and moving towards community pest management instead of individual pest management.

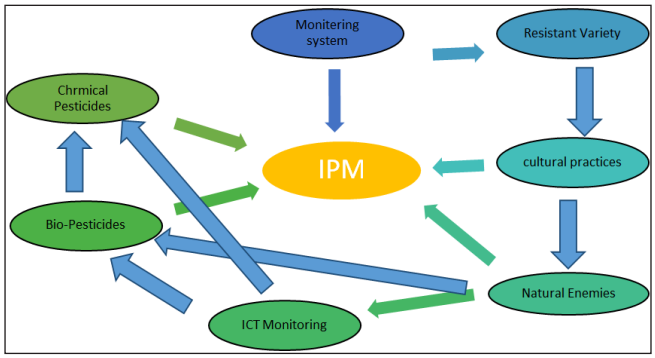

Figure 1.Diagrammatic Representation of IPM Components

Crop Monitoring

Crop Monitoring is the premise of IPM and monitors the creepy crawly bugs and their conceivable harm on the harvest. It is useful in choosing the most ideal blends of the bug the board strategies, likewise gives information about the current irritations and yield circumstance. There are a few yield observing apparatuses, yet Pheromone traps being light and tacky have advantage over different devices. They have demonstrated their significance in enormous scope IPM approvals in cotton, basmati rice, chickpea and pigeonpea, being particular to explicit pest.

Cultural Pest Control

Crop turn, fallowing, control of planting and gathering dates, control of plant and column dispersing and annihilation of old harvest flotsam and jetsam are a couple of instances of social strategies that are utilized for the executives of the pest. The significant administration methods incorporate Planting of cover crops, nectar delivering plants and between planting of various harvests to give natural surroundings variety to helpful creepy crawlies. It incorporates crop creation rehearses that make crop climate less vulnerable to bugs. A cover harvest can likewise be utilized as a green fertilizer, which is joined in the dirt to give nitrogen and natural make a difference to the resulting crop. Social controls are chosen dependent on information on bug science and their turn of events.

Physical or Mechanical Controls

Hand picking of creepy crawly bugs is maybe the least difficult actual strategy to control the bug. Mechanical control strategies depend on the information on bug conduct. Putting plastic-lined channels in potato fields to trap relocating Colorado potato insects is one illustration of the actual control. Shaking of the pigeonpea plant to eliminate Helicoverpa hatchlings is a typical practice in pigeonpea developing regions. Establishment of dead just as live bird roosts in cotton and chickpea fields has demonstrated viable in really looking at the bollworm pervasion. Utilizing mulches for smoothening weeds and giving column covers to shield plants from creepy crawlies are different instances of such control techniques.

Biological Control

Various microorganisms, for example, Trichoderma spp., Verticillium spp., Aspergillus spp., Bacillus spp. what's more, Pseudomonas spp. that assault and smother the plant microbes have been taken advantage of as natural control specialists. Organic control incorporates expansion and protection of normal foes of bugs like bug hunters, parasitoids, parasitic nematodes, growths and microorganisms. The local normal foe populaces are preserved in IPM programs and non-local specialists might be delivered with most extreme alert. Trichogramma spp. are the most well known parasitoids being applied on various host crops.

Chemical Control

At the point when the pest can't be constrained by different means, pesticides are utilized to keep the bug populaces underneath financially harming levels. A wide scope of man-made synthetic compounds are remembered for the Synthetic pesticides which are effective, simple to utilize and somewhat economical. Due to their possible adverse consequence on the climate, preferably pesticides ought to be utilized if all else fails in IPM programs. Pesticides with the most un-adverse consequences on non-target life forms and the climate are generally valuable. Luckily, new age pesticides with low natural impacts and novel methods of activity are being created and enrolled for use. Pesticides that are brief or follow up on one or a couple of explicit living beings fall in this class. There is a lot of exploration, that has been done to decide the harm edges for an assortment of harvests and nuisance circumstances, yet the investigations are uncertain. Monetary limit evaluation depends on the idea that most plants can endure in some measure some nuisance harm. In an IPM program where the

financial edge is known, synthetic controls are applied just when the bug's harming limit is approaching to the edge, notwithstanding utilization of other elective administration rehearses. A few botanicals are expansive range pesticides and can be ready in more than one way as crude squashed plant leaves, concentrates of plant parts and synthetic compounds purged from the plants. Pyrethrum, neem, tobacco, garlic and pongamia definitions are not many instances of botanicals and are by and large less risky to ship and less unsafe to the climate on account of their speedy corrupting property. The significant benefit is that these can be defined on ranch by the actual farmers.

Pest Resistant Varieties

Reproducing for bother obstruction is a nonstop cycle. Simultaneously the pest additionally, especially the plant microbes, co-develop with their hosts. In this way, quality exchange innovation is helpful in creating cultivars impervious to creepy crawlies, plant microorganisms and herbicides. An illustration of this is the joining of hereditary material from Bacillus thuringiensis (Bt), a normally happening bacterium, in cotton, corn and potatoes, which makes the plant tissues poisonous to the creepy crawly bothers. Academic people group is dazzled by its immense potential in dealing with the pest, but at the same time is worried about the chance of expanded determination strain for obstruction against it and its impacts on non-target normal fauna. Nonetheless, because of moral, logical and social contemplations, this potential innovation has been encircled by contentions.

IPM on an Ecological Basis

IPM in rice is presently unequivocally dependent on its communication with soil supplements and assortments and natural comprehension of the harvest. The rice biological system in Asia is crude to the district as rice was first trained before the written history, maybe over 6000 years prior (Ponting, 1991), while arriving at development like that of current days in the sixteenth century (Hill, 1977). This extensive time span shows that the rice yield, bothers and their normal foes have existed together and coevolved for great many ages. Rice biological systems, during the season with ordinary flooding from water system or precipitation, ordinarily incorporate both an earthly and an amphibian climate. These two components of the rice yield might represent the very high biodiversity found in the rice environment and its dependability considerably under concentrated consistent trimming interestingly, with the general shakiness of rice creation under dryland conditions.

Economic Incentives

Financial Incentives urges farmers to switch over to IPM. The cost of an innovation is the main factor in farmers' choice for its reception. As of now, bio-pesticides are regularly given at financed costs under IPM programs and a mass comes from public area. The proof shows that advantages of reception of IPM are possibly higher than the traditional synthetic bug control. An expansion in the cost of bio-pesticides because of cost contemplations or withdrawal of sponsorships would be one justification for upsetting the financial aspects of IPM. Since bio-pesticides produce impressive social and natural advantages, the public authority should consider characterizing them into 'green box' for arrangement of endowments. Connecting of rural credit and protection to IPM can likewise work with its quicker and wide dispersion.

To make the creation and utilization of substance pesticides ugly through financial instruments of expenses, extract obligations, deals charges and so forth on middle person data sources and last yield could be another option. The record of burden of weighty charges on pesticide industry was one justification for decrease in pesticide use during the mid 1990s. The pesticide business, which has set up solid market in the course of the most recent thirty years, may oppose it, however it could be sought after to switch over to creation of more secure pesticides and bio-pesticides. Withdrawal of appropriations on synthetic pesticides and redirection of the equivalent towards creation and utilization of biopesticides, and connecting institutional acknowledge and protection for IPM reception would instigate farmers exchanging over to IPM.

Integrated Pest Management (IPM) is a method that helps reduce production costs, reduce pesticide exposure, and improve the long-term sustainability of agricultural systems. Perkins (1982) Integrated Pest Management (IPM) is a scientific paradigm which is now of global significance. Its basic concern is with designing and implementing pest management practices that meet the goals of farmers, consumers and governments in reducing pest loses while, at the same time, Prevent the long-term risks of environmental pollution, human health hazards and reduced agricultural sustainability.

On Farm Implementation of IPM

An aggregate activity, bunch approach of choosing towns and farmers in coterminous regions, co-appointment of the public authority organizations, NGOs, industry and farmers for the huge scope execution of IPM. The Indian Council of Agricultural Research (ICAR) started different Operational Research Projects (ORPs) on IPM for rice under the management of the Directorate of Rice Research (DRR), Hyderabad, Kerala Agricultural University and Department of Agriculture, West Bengal and furthermore reception of IPM rehearses brought about expansion in the rice yield. There are likewise different instances of fruitful execution of IPM in rice in chosen locale of the states like Haryana, Tamil Nadu, Andhra Pradesh, Uttar Pradesh, Kerala and Madhya Pradesh (Razak, 1986). The above idea follows

a prescriptive methodology wherein innovations fitting to farmers conditions are created in the exploration establishments and moved to the farmers for execution. Be that as it may, numerous advances created by the specialists are unessential to the farmers conditions and are at long last deserted. For example, seedling root plunge procedure of insect spray application for controlling early season bugs in the wake of relocating would never discovered spot among the farmers practices. This is chiefly because of the way that the strategy of seedling root plunge is considered bulky, and conveying the treated seedlings on heads is negative to human wellbeing. Also, large numbers of the assortments created with BPH obstruction couldn't track down their due place in farmers' fields because of helpless thresh ability and grain quality. The most recent pattern in IPM is 'base up' or 'participatory methodology'. In this manner, IPM can be depicted as the best mix of control strategies coming about into better return and benefit and security to the people and climate. In circumstances where pesticides have been in need for quite a while, the point is to limit their utilization as much as plausible. The principle center is to expand the utilization of natural and social parts, including host plant opposition and organic control specialists. This obviously shows the need of understanding the farmers' insights, information and conditions with regards to cultivating frameworks and in addition to the rice crop alone. Hence, IPM includes working with the farmers in their fields and formulating advancements reasonable to their conditions. Numerous farmers once in a while separate between the sickness manifestations and the nourishing issues.

Development of Market for Pesticide Free Products

To diminish the utilization of pesticides, markets could be produced for without pesticide or low-pesticide buildup produce by making buyer mindfulness about medical advantages of such produce. There are no top notch markets and principles for natural food in India as of now. Since in the short-run there is plausible of decay or reduction in yield on exchanging over to IPM and farmers regardless of whether, will take on IPM may not do as such. In created nations market for pesticide free items are being created and these items get top notch costs which is anyway ailing in India. This would require advancement of certificate strategies as well as the marking framework to acquire certainty of the customers. The expense of confirmation is high for a singular farmer however the expense can be cut down impressively if a gathering approach is followed. Advancing basic and financially savvy accreditation and naming frameworks to empower farmers to deliver without pesticide items and to acquire certainty of the shoppers will support reception of IPM.

The NCIPM national primer IPM research institution in India has developed and promoted IPM technologies to manage pests in Basmati Rice in the villages of Uttar Pradesh, Uttrakhand, Haryana and Punjab through participatory approach. Despite of several advantages of these technologies the adoption at the farmer level is not very encouraging. Besides, the use of innovative extension approaches including Farmer Field Schools (FFSs), field days, exposure to other farmers, and written media (e.g. pamphlets) for wide area approach of IPM adoption. Basmati Rice production is associated with heavy use of chemical pesticides to manage pests and optimize profits The commercial pressure of farmers to use pesticides and the idea of pesticide companies to disrupt IPM research and implementation activities may be important in certain situations. The more important reason for not adopting IPM is that IPM "products" are usually not suitable for farmers' needs (Norton-1976, Goodell-1984). Farmers may perceive IPM as too complex, too expensive, too risky and just not appropriate to their farming system. Concerns have emerged about the adverse consequences of pesticide over use. These consequences include short and long-term health hazards and environmental degradation.

Therefore, it is most necessary for the scientific community to find and analyze the field restrictions when using IPM technology (as farmers believe) especially in the Rice cultivation in the third world countries where excessive and indiscriminate use of the pesticides were reported by various researchers like Rashid et al. (2003), IPM DANIDA Project (2004), Kim and Park (2005), Baral et al. (2006) etc.

Essentials for Implementation

To carry out a fruitful IPM program, an IPM plan should be created, upheld and executed from the highest point of the association down. When the program is created, correspondence of the arrangement is fundamental. Following are the couple of focuses:

- Availability of area explicit IPM modules, which are biologically solid, feasible and socially satisfactory
- Target bunch cooperation at a more elevated level
- Area-wide dispersal technique
- Removal of obstructions in spread of IPM
- Measuring, assessing and publicizing the effects of IPM

Protection of regular adversaries of nuisances and their increase is of prime significance. Henceforth, to keep up with environmental equilibrium and to deal with the nuisances, the utilization of bio-specialists and biopesticides/botanicals should get need consideration.

Does IPM Work for Rice Farmers?

IPM needs a ceaseless up degree of the eco-friendly pest management innovations according to the pest problems faced by the Basmati rice growers in location specific to

accomplish the objective of expanding the efficiency levels to IPM practices satisfy the needs of Basmati rice growers. The preparation programs on IPM were begun all through the IPM researchers and developed IPM practices at the farmers fields in participatory mission mode. The participation of farmers in IPM implementation programme has developed confidence among farmers in the IPM practices. Participatory extension approaches increased the knowledge level and positive perception towards IPM practices and developed knowledge towards Basmati Rice IPM. The farmer field schools enhanced the skills of farmers in pest management and also developed capacity to identify the enemy pests. The incorporation of promising worthy IPM practices in conventional pest management increased the adoption of IPM among the Farmimg community.

It was observed that the farmers have learnt the pest management practices, understood the pest management skills and ability to identify various stages of the pest and differentiate between symptoms of damage due to insects and pathogens. In the study village the majority of Basmati rice growers were following the prescribed cultural and mechanical pest management practices for minimizing the pesticide consumption. IPM programme was able to convince that farmers to use reduce risk pesticides instead of broad spectrum pesticides.

In spite of the fact that there is a lot of constraints identified with the effect of rice-IPM on farmers. A review of the literature on IPM using Basmati rice shows that farmers are not fully prepared for GAP using Basmati rice, which requires research through policy intervention and extension work to strengthen the adoption process.

Nonetheless, there are many factors that affect farmers' decision to adopt or not adopt IPM technology, because IPM technology is relatively new, therefore they are not clearly identified. Adoption of the Integrated Pest Management (IPM) technology as the advanced technology for sustainable agriculture is tremendously important. Therefore, it is very important to identify the constraints in adoption of IPM technology and sustainability of IPM technology.

The programme focused on locating the factors affecting the adoption of IPM practices in Basmati Rice cultivation under the farmers' perception to provide relevant and useful information for suggesting to build up the strategies and policies for promoting IPM in larger area in Basmati Rice. Factors such as weak state extension support, pest management information and input delivery, marketing strategies and aggressive propaganda and malpractices of pesticide companies were perceived by the cauliflower growers in the study area. It was observed that post implementation of IPM programme, the farmers were adopting the IPM components which were easily available in the local market and requiring the minimum investment in pest management.

Conclusion

The implementation of Basmati rice IPM programme has focused on the amelioration of the constraints for the promotion of IPM in larger area is needed on the priority. The constraints ameliorated with the active involvement of various stakeholders of IPM at one platform. The IPM researchers developed eco-friendly pest management practices on the farmer field in farmer participatory mission mode with involvement of farmers and other IPM stakeholders. The arrangement of marketing of Basmati rice at premium price at door step of farmers by the private company provided economic and social viability of IPM technology. Thus the pro-active role of state extension agencies in information delivery and input supply certainly will motivate the farmers for adoption of IPM. The role of the state extension agencies is to be strengthening for transfer and dissemination of these proven cauliflower IPM technologies directly to the farmers through farmer participatory approaches. Accelerating the adoption of Basmati Rice IPM technologies and its sustainability improved by active involvement of working farmers association for assured availability of quality IPM components. Besides farmer associations, SHGs can also play vital role in providing pest advisory services by facilitating IPM and extension services to farmers in collaboration with research and extension institutions. The experiences of IPM implementation and IPM promotion may be designed in collaborative mode with extension agencies and farmers association. These ameliorating measures may easily facilitate the IPM inputs and build up the capacity of farmers and extension workers in the area of training, input and information delivery. The partnerships of IPM stakeholders certainly may overcome the adoption constraints and minimize the dependency on the local private pesticide dealers.

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