Integrated Pest Management (IPM) – A new dimension in sustainable agriculture development

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Abstract

The Demonstrations are being organized to decrease cost of cultivation and increase paddy productivity in Gadchiroli district. The demonstration conducted on 20 ha^{-1}, under Front line demonstration since last two years. The classical method is IPM Technology has begun in rice during 2020-21. Bio-Pesticide technology in rice cultivation has been promoted and propagated by the Spirit of KVK system in the district. The measurement of pest and disease on paddy for the application of chemical insecticide based on ETL level. The major pest on paddy is stem borer, Gall midge fly, Army worm, case worm and Hoppers (BPH, GLH, WBPH) they are mostly harmful to crop damage. Foliar spray (Borer & cutworm): Mix Bio-Power @ 4 kg / hectare in 500 liters of water (i.e., 6 ml or 8 gm per Liter of water). first spray on paddy nursery after taken at 14 DAS (Days after seedling) and the second spray taken after 40 DAT (days after transplanting) for control of Stem borer, case worm and army worm on paddy. The incidence of Stem borer (4.2% and W.E is 3.2%), case worm (2.2%) and Army worm (0.2%) was observed as compare to farmer plot i.e Stem borer (10% and W.E is 8%), case worm (2.8%) and Army worm (2%). To manage the Hoppers on paddy used yellow and blue sticky trap @ 25 trap/ha to monitor ETL level of hoppers on paddy and application of Metarhizzam spp. (*Clavicipitaceae*) @2.5 kg ha^{-1}, when these to application the incidence of hopper (2-3/hill) on paddy observed very less and yield of demonstrated plot is increase i.e (14.68 qtl./acre) was observed as compare to farmers plot (11.92 qtl./acre) was observed and cost of cultivation of demonstrated plot was (Rs. 16282/-) decrease as compare to farmer practices (Rs.24328/-).

Keywords: ETL, mix bio-power, WBPH, BPH, GLH, DAS, W.E, metarhizzam

Introduction

Gadchiroli (M.S) is a heavy rainy district with an annual average rainfall of 1500 mm. This is the only crop that can be taken in Kharif season. 76 percent of the district's Geographical area' Under the forest. Out of the area under cultivation Rice is grown on 63 lakh hectares. The average yield of rice crop in the district is 3200 kg per hectare. Demonstrations are being organized to increase productivity. In the current condition and in a traditional way, in the same way, the classical method is IPM Technology has begun in rice from 2021-22.

The Demonstrations are being organized to increase productivity. In the current condition, in a traditional way, in the same way, the classical method is IPM Technology has begun in rice during 2020-21. Technology has begun to be used for rice cultivation. In the traditional cultivation, application of seed treatment, organic insecticide, trap and chemical insecticide when used not proper dose and number of spray/hector of spraying is not done hence, pest and disease effect and decrease the production. By improving this ethnic system of Bio-Pesticide technology has begun in rice (Bandong JP, *et al*) 2009 [4].

Bio-Pesticide technology in rice cultivation has been promoted and propagated by the Spirit of KVK system in the district. On a large scale, its use is currently underway. Integrated pest management (IPM) is a broad ecological approach for pest management which employs all available skills, techniques and practices such as cultural, mechanical and biological methods including application of chemical pesticides as a last resort in a harmonious and compatible manner with a view to suppress pest population below economic injury level, based on regular crop pest surveillance and monitoring (Teng PS and Savary S) 1992) [44].

IPM Determined Objectives

- Knowledge of the rice production system, its component species (including the rice plant) and the nature of interactions between these species. It is also essential to understand how rice ecosystems, particularly their pest and disease populations, are regulated through negative feedback loops.
- Tools to ensure that the outcomes of natural regulation favour yield and that ecological pathways (succession) towards damaging crop health syndromes are avoided. Such tools include traditional pest management practices such as flooding fields to prevent Pest, using traps and sticky trap or barriers to exclude rodents or biological control. Among these tools, pesticides must be carefully considered, as has been shown, since pesticides are often the underlying cause of pest-mediated damage and threaten environmental and human health.

Methodology

During the year 2021-22 Krishi Vigyan Kendra, Sonapur-

Gadchiroli (M.S) conducted demonstration on the subject of IPM in Paddy at Tribal village Sidewada Taluka Bhamragad over 20 hector land. Village people is very polite and innocent they are unaware regarding the technology. KVK Gadchiroli adopts village to transfer the technology on farmer's field under ATMA scheme 2020-21 KVK, provide all input to farmer under the technology.

Table 1

Objective	**To reduce the infestation of pest on paddy with application of IPM technology.**
Problem identified	▪ Farmers do not recognize pest and disease at early stages. ▪ Population of pest increase. ▪ No application of bio-pesticide ▪ Application of chemical insecticide but not follow reccomendation.
Discipline	Plant Protection
Season	Kharif-2021-22
Name of crop	Paddy
Type of Demonstration on (Whole package/ Component)	Single component
Purpose of demonstration	To reduce the infestation of pest and disease on paddy with application of IPM tools.
Yield (q/ha)	Existing – 30 q/ha, Potential – 33 q/ ha^{-1}.
Farming situation	Rainfed / Irrigated – Rainfed
Soil type	Clay loam
Previous crop	Gram
Area	20 ha^{-1}. (50Acre)
No. of Farmers	50 (1 Acre per farmer)
Name of villages	Sidhewada Taluka Bhamragad
Critical inputs identified	*Beauvriabassina, Metarrhiziumanisopliae, Trichocard* @ 2 release, yellow and Blue sticky trap, Pheromone trap etc
Cost of critical inputs	3000/-(per acre)
Observations/Parameters of study relevant to Technology demonstrated	▪ One infested leaf /hill (rice caseworm) ▪ No. of damage (rotted) panicle /plant ▪ Per cent damage (rotted) panicle /plant. ▪ Yield (q/ ha-1,) ▪ 5. B:C Ratio.

Fig 1

IPM Strategies

Cultural practices

Cultural practices are integral part of IPM. Summer ploughing, selection of healthy seeds, timely planting, raising of healthy nursery, removal of weed from field, balanced use of fertilizers as per recommendations are the important cultural practices that are followed for pest management in paddy (Peshin, R. and Dhawan, A. K.) [4].

Mechanical practices

Mechanical practices comprise of removal and destruction of pest infested plant parts, clipping of rice seedling tips and collection of egg masses and larvae of pest and their placement in bamboo cages for conservation of biocontrol agents (Culliney TW, 2005) [9].

Biological control practices

Bio-control agents like coccinellids, spiders, damsel flies, dragonflies should be conserved. Chlorpyriphos is used for root dip treatment of rice seedlings. Egg, masses of borers are collected and placed in a bamboo cage cum preacher till flowering. It permits the escape of egg parasites and trap and kill the hatching larvae (Dela Cruz and CG, Litsinger J, 1988) [10].

Behavioral control

Pheromone traps are installed at the rate of 2 traps/acre to trap yellow stem borer at 10 days after transplanting (Kojima A, *et*

al, 1996) [22]. In the month of august-Sept. installed sticky trap to monitor BPH and GLH and WBPH (Witzgall P, 2010) [45].

Chemical control measures

Chemical control measures are used under IPM as a last resort. Application of pesticides has to be need based and proper crop health monitoring, observing ETL and conservation of natural bio-control agents has to be ensured before deciding in favors or use of chemical pesticides.

Application of *Beauveria bassiana*

Foliar spray (Borer & cutworm): Mix Bio-Power @ 4 kg / hectare in 500 Liters of water (i.e., 6 ml or 8 gm per Liter of water). First spray on paddy nursery after 14 DAS (Days after seedling).Second, spray taken after 40 DAT (days after transplanting) for control of Stem borer and case worm and army worm on paddy (Meyling NV, Eilenberg J 2007) [27].

Application of *Metarhizzum ansopilli*.

Dusting of Metarhizzum ansopilli.1.15% powder (1x108 CFU/gm min) @ 2.5 kg/ ha-1. (Recommendation of Dr. PDKV, Akola) to control the plant hopers on paddy (PDKV, 2020, Krishisavadini) [31].

Result

The measurement of pest and disease on paddy for the application of chemical insecticide based on ETL level. The major pest on paddy is stem borer, Gall midge fly, Army worm, case worm and Hoppers (BPH, GLH, WBPH) they are mostly harmful to crop damage Hence, the method of application of IPM strategy (Dela Cruz, 1988) [10]. Foliar spray (Borer & cutworm): Mix Bio-Power @ 4 kg / hectare in 500 liters of water (i.e., 6 ml or 8 gm per Liter of water), (PDKV, 2020, Krishisavadini) [31]. First spray on paddy nursery after taken at 14 DAS (Days after seedling) and the second, spray taken after 40 DAT (days after transplanting) for control of Stem borer, case worm and army worm on paddy.

The incidence of Stem borer (4.2% and W.E is 3.2%), case worm (2.2%) and Army worm (0.2%) was observed as compare to farmer plot i.e Stem borer (10% and W.E is 8%), case worm (2.8%) and Army worm (2%) (Bentley JW, 2009) [4].

To manage the Hoppers on paddy used yellow and blue sticky trap @ 25 trap/ha to monitor ETL level of hoppers on paddy and application of Metarhizzam spp. (*Clavicipitaceae*) @2.5 kg ha-1, when these to application the incidence of hopper (2-3/hill) on paddy observed very less on demonstrated plot as compare to farmer plot (12-14 hoppers/hill) (Loc NT *et al*, 2005) [25].

Also the yield of demonstrated plot is increase i.e (14.68 qtl./acre) was observed as compare to farmer plot (11.92 qtl./acre) was observed and cost of cultivation of demonstrated plot was (Rs. 16282/-) decrease as compare to farmer practices (Rs.24328/-) and production increase up to 14.68 qtl./acre.

Table 2: Observation on Insect pest observed on demo plot and farmers field

Parameters of assessment	Technology Assessed		Results of assessment
	T2: Technology Assessed	T1: Farmer practices	
1. One infested leaf /hill (rice case worm)	1.2	4.09	11.57% increase in yield
2. one egg mass/m2, 5% dead hearts (Stem borer)	2.50	4.2 DH and (3.2% W.E)	
3. One gall/m2	1	3	
3.Hoppers/hill	6.73	14.56	
4.Damaged leaf per hill	1.17	2.64	
5. Yield (q/ ha-1).	36.40	34.70	
6. B:C ratio	3.2	1.2	

Table 3: Cost of cultivation

Technology Assessed	Gross Return (Rs.)/acre	Cost of Cultivation (Rs.)/acre	Net Return (Profit) in/ unit /acre	B:C Ratio/acre
T1: Farmers practice: No application of recommended insecticide/dose as per recommendation.	72870	12000	60870	1.8
T2: Technology Assessed:To reduce the infestation of pest and disease on paddy with application of IPM tools.	76440	7000	64440	3.7

*The incidence of pest and disease was minimum observed when application of bio-pesticide practices on demonstrated plot and maintain ETL level and increase the natural enemy in area.

Conclusion

The application of *Beauveria bassiana* Foliar sprays (Borer & cutworm): Mix Bio-Power @ 4 kg / hectare in 500 Liters of water (i.e., 6 ml or 8 gm per Liter of water) for control of Stem borer, case worm and army worm on paddy. The fungal strain *M. anisopliae* had good potential for the rice plant hopper control. Application of *Metarhizium spp*. (*Clavicipitaceae*) @2.5 kg ha, when these to application the incidence of hopper (2-3/hill) on paddy observed very less on paddy field (PDKV, 2020, Krishisavadini) [31].

*The incidence of pest and disease was minimum observed when application of bio-pesticide practices on demonstrated plot and maintain ETL level and increase the natural enemy in area.

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