*Plant Archives* Vol. 17 No. 2, 2017 pp. 1037-1040 *ISSN 0972-5210*

# COMPARATIVE ADOPTION STUDIES OF DIFFERENT IPM COMPONENT AGAINST PIGEON PEA PESTS

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## Abstract

Adoption of Integrated pest management technologies of Pigeon pea was studies during 2014-15 among 150 respondents of three blocks of Katni district in kymore plateau and satpula hill agroclimatic zone of Madhya Pradesh. It is observed that 18.67 per cent deep summer ploughing,17.33 per cent crop rotation, 79.33 per cent seed treatment, 15.33 per cent selection of disease resistant varieties, 64.66 per cent timely sowing and 7.33 per cent inter cropping system with sorghum/bajara were practicing by respondents .In mechanical management practices, 20.66 per cent respondent were mechanical roughed out the disease and pest affected plants from the field whereas of 43.33 per cent adoption observed towards the manual weed managemen. Only 26% adoption was noted in the use of pheromones trap for pest management. *Trichoderma* was best against soil born plant pathogen. HaNPV, Bt, *and Beauvaria bassiana* were most effective against insect pests. However 28.66% respondent prefers trichoderma and 24.66% adapted HaNPV, Bt and *Beauvaria bassiana* for the management of pod borer, pod fly, cut worm etc. Chemical management practices became very popular among the farmers due to easily availability and quick effect against the pest management resulting 86% per cent respondents were adopted chemical management practices for disease and insect management in pigeon pea. Lacks of knowledge about identification of beneficial insects are the major constraints resulting farmers diverted towards chemical management practices. Low categories of farmer were more efficient to adopt the IPM practices than medium and high level of respondents.

***Key words:*** Pigeon pea, Adoption Level, Constraints, Integrated Pest Management Practices.

## Introduction

Pigeon pea (Cajanus *cajan* (L.) Millspaugh) commonly known as Red gram is the most important food legume crop of Madhya Pradesh and sown in 0.53million hectares area with 625 kg /ha productivity. In Katni district, it is cultivated on an area of about 21 thousand ha with the production of 18.75 thousand tons and productivity 892 kg / ha. Apart from the production shortage, the crop is highly attack by a wide range of insect pest and diseases. Most of the pests attack the crop at reproductive stage causing direct losses 30 to 80% (Asthana *et al.*1997). Major insect pests of pigeon pea are pod borer (*Helicoverpa armigera*), Pod fly (*Melanogromyza obtusa*), Spiny brown bug (*Clavigralla gibbusa*), blue butterfly (*Lampedes boeticus*); Leaf webber (*Grapholita critica*), Cut worm (*Agrotis ipsilon,Ochropleura flammatra*) and termite (*Odontotermes* spp.) as reported by Arora and Dhaliwal,1996. Sharma *et al.* (2010) reported the major diseases like fusarium wilt (*Fusarium udum*), Sterility mosaic (*Pigeon pea* sterility mosaic virus), Phytopthora blight(*Phytopthora drechslei* spp *cajani*) and Cercospora leaf spot (*Cercospora indica*) which are causing huge losses to the crop. In view of a wide variety of pest and diseases, long reproductive phase and socio-economic constraints, the managements of pests in pigeon pea is relatively difficult (Shanower *et al.* 1999; Srivastav and Joshi 2011). Different components of IPM like cultural, mechanical, biological and chemical are recommended for pest management and the frequency of adoption of these practices is depicted separately at the end and farmers need to aware towards this technology. Farmers require an attention to practice integrated pest management module in pigeon pea for

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bridging the technological gap and intension gap with encourage step has taken Krishi Vigyan Kendra Katni.

## Materials and Methods

The present study was conducted in four selected block of Katni District during 2014-2015. The total number of respondent of 150 from 25 random respondents of each selected block. The integrated pest management practice were classified into four major categories, *viz.* cultural, mechanical, biological and chemical practices and six, three, three and one parameters were included in each category. The adoption level of integrated pest management practices was estimated in term of acceptance of technology by respondents as given by Singh *et al.* in 2014. The adoption was categorized into three levels *viz.*, full, partial and non adoption and these were assigned the score 2, 1 and 0, respectively. The total score of all categories was considered as adoption score of individual. In this study, the source of pest management information and use of plant protection equipments to the sampled farmers and constraints refers to the problem faced by the respondents in adopting the recommended components of IPM practices were studied. Another field experiment was carried out to ascertain the field efficacy of IPM component in different combination against pests. This experiment was conducted in the same block s as mentioned above with eight treatments including control. In biological component we have taken trichoderma, HaNPV, Bt and NSKE however Bavistin and ridomil MZ 72 fungicides and three insecticides like trizophos, indoxacarb and phipronil were taken in chemical component against disease and insect pests. Summer ploughing, field sanitation & seed treatment used in cultural method. In mechanical we have taken different sub components of mechanical management such as hand removal of pests, roughing of affected plants and installation of pheromone traps. All the recommended agronomical practices were followed to raise the crop. Crop sown on raised bed with 1×1 meter plant to plant and line to line distance in the last week of June.

## Results and Discussion

### Technologywise Adoption of Integrated Pest Management

It might be seen from the present investigation summarized in table 1 showed that the highest (50%) adoption of technology was adopted by low categories of farmer followed by medium (35.33%) and high (14.66%). Because, farming of higher categories mostly depend on hire labour whereas low and medium farmer engaged self in the farming system.

Summer deep ploughing is essential for management of soil born plant pathogen and soil habitant pests**.** It is observed from table 2 that only 18.67% of the respondents adopted summer ploughing. Summer deep ploughing found effective when done in the month of April/ May when the temperature reach above 40$^0$C, suited for the management of insect pests eggs/larvae and soil habited initial inoculums of disease. Same results were also reported by Sandeep *et al.* 2013.Three year crop rotation is a very important to manage many soil borne plant diseases *viz.* fusarium wilt, Phytopthora blight, and Cercospora leaf spot. In the present investigation only 26 out of 150 of the respondents (17.33%) were adopting crop rotation. Rotation do not help to manage borer and others very mobile insect pests, although it has been noted that some crops are more attractive to the moths so susceptible crops should not be planted too close to the main crop (Dahiya, 2013). According to our investigations, majority of the respondents (79.33 %) were using seed treatment with fungicide/trichoderma + rhizobium culture +PSB+chloropyrophos. Seeds treatments not only increase the seeds germinability but also save the seeds from the attack of soil born plant pathogen and pests. Only 23 respondents (15.33%) were adopted recommended varieties. Selection of suitable varieties is a very important for better performance and to ensure higher yield and profit. The use of resistant varieties is the most important approach to minimizing the extent of losses due to pests and diseases without additional monetary investment by the farmers. Early and late maturing varieties of pigeon pea were more infested by *Hellicoverpa armigera.* Mid late maturing crops escape pod borer damage as the variety in completes podding stage pods become harder prior to initiation of infestation. Sowing time is a major limiting factor for managing the crop by the attack of biotic and biotic factors (Chaudhary *et al.*, 2001). Timely sown crop always escape form the infestation of pests and a biotic factor like frost. It was evident in the presented investigation that 64.66% respondents were sown their crop timely. The incidence of *Hellicoverpa* spp. was low in pigeon pea intercropped

**Table 1:** Distribution of respondents according to their level of adoption of components of IPM practices in Pigeon pea. (N=150)

| S. No. | Categories of adoption | Number of respondents | Percentage of adoption level |
|---|---|---|---|
| 01 | Low | 71 | 47.33 |
| 02 | Medium | 56 | 37.33 |
| 03 | High | 23 | 15.34 |
| | **Total** | **150** | **100.0** |

**Table 2:** Technology wise adoption of components of IPM in Pigeonpea.
( N=150)

| S. No. | Integrated pest management practices | Number of respondents | % of adoption level |
|---|---|---|---|
| **A:** | **Cultural Management Practices** | | |
| 01 | Summer ploughing | 28 | 18.67 |
| 02 | Crop rotation | 26 | 17.33 |
| 03 | Seed treatment | 119 | 79.33 |
| 04 | Selection of disease resistant varieties | 23 | 15.33 |
| 05 | Sowing time | 97 | 64.66 |
| 06 | Inter cropping with Sorghum/ Bajara | 11 | 7.33 |
| **B:** | **Mechanical Management Practices** | | |
| 01 | Hand removal of insects and rouging of diseased plants | 31 | 20.66 |
| 02 | Weed management | 65 | 43.33 |
| 03 | Installation bird perches & Pheromone traps | 39 | 26.0 |
| **C:** | **Biological Management Practices** | | |
| 01 | Use of *Trichoderma* spp. against diseases | 43 | 28.66 |
| 02 | Use of Bio-Pesticides and Bio - agent against insect pests | 37 | 24.66 |
| 03 | Use of plant based products (Neem Seed Kernel/ leaf Extract of Neem, Datura, Oak etc.) | 13 | 08.66 |
| **D:** | **Chemical Management Practices** | | |
| 01 | Chemical Management (Bavistin and ridomil MZ 72 against diseases and trizophos and endoxacarb against insect pests) | 129 | 86.00 |

with sorghum due to increased activity of natural enemies like Chrysoperla, Chilomenes, sexamaculatus, Oricus sp., Spider and predatory birds in which sorghum act as a live perch for birds to trap *H. armigera* larvae from greater distance and height. Ganapathy (2010) reported that intercropping with monocots like Sorghum, Maize, pearl millet mung and urdbean reduced the incidence of pest specially pod borer. Reduction in wilt incidence was also observed when pigeon pea was grown either mixed or intercropped with sorghum (Naik *et al.* 1997). It was revealed in the present investigation that only 7.33 per cent respondent were adopting intercropping pattern with sorghum in their pigeon pea field.

The weeds may even directly contribute to pest multiplication by providing preferred surface for oviposition (Dahiya 2013). Removal of the weed at a time when maximum eggs are laid substantially reduces the incidence of pod borer, *H. armigera*. Ganapathy (2010) reported that removing of leguminous weeds reduced the damage of *H. armigera* in pigeon pea crop. Table -2 clearly indicates that only 43.33 percent respondents were adopted weed management practices. Degree of yield losses by weeds depends upon nature and severity of weed infestation (Kumar *et al.* 2015). However, Chauhan and Singh (1991) have claimed that the intensity of phytophthora disease was significantly reduced in weed infested plots. Only twenty six percent respondents were found to use pheromone traps for management of pod borer complex in pigeon pea. Insect sex pheromones are biochemical pesticides and have long been used as monitoring and mass trapping tools for legume pod borers in Integrated Pest Management strategies. Pheromone traps @ 10/ ha during August- September and November–December were helpful to monitoring and mass trapping of the pest population (Rolania and Yadav, 2013).

It is evident from the data presented in table no. 2 that 28.66 percent respondents were used *Trichodermas pp*. as seed and soil treatment to manage different fungal diseases of pigeon pea, whereas, use of *Trichoderma sp. for* managing soil born fungal diseases is very effective as reported by Mukhopadhyay and Mukharjee,1991. It is not only enhances the growth of plants but also save the plant with diseases.

Twenty six percent farmers were used microbial pathogens such as nuclear polyhedrosis virus (NPV), *Bacillus thuringiensis, Beauvaria bassiana*, *Metarhizium anisopliae*. While, HaNPV and Bacillus *thuringiensis* have been found more potential agent against the gram pod borer as also reported by Kapasi *et al.* 2013 and Santhoram *et al.* 1991. Biobit and Halt (Bt formulation) @ 1.0 kg / ha controlled gram and tobacco pod borers and increased grain yield.

A perusal of data in table -2 indicates that only 8.66 percent respondents were used Neem Seed Kernel Extract (NSKE) against pests. Sharma *et al.*, (2011) advocated that Neem Seed Kernel Extract (NSK E) outperformed than other bio-pesticides in the term of per cent increase in the grain yield and lowest pod damage.

Fusarium wilt, phytopthora and sterility mosaic disease were recorded measure problems in the standing crop and mostly farmer used bavistin, ridimil MZ 72 and trizophos as per recommendation against the disease. Adoption level towards the chemical control was eighty six percent (table -2). Mostly farmers used trizophos, propheanophos and phiprinil against pod borer, pod fly, termite and other pests. The strategy of good plant protection technological practices advocateschemical alone and need based application of chemicals (Gandhi *et al.* 2013; Patil *et al.*, 2012; Kumar and Nath, 2003; Singh and Kumar 2012; Singh, S.S. and Yadav, S.K. 2006).

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