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INFLUENCE OF DIFFERENT COLOURS ON THE EFFECTIVENESS OF WATER PAN TRAPS TO CAPTURE INSECTS IN MUSTARD ECOSYSTEM

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ABSTRACT

Field studies were conducted at farmer field located at Tando jam to compare the efficiency of horizontal water pan-traps of five different colours, to assess their effectiveness in measuring the landing rates of different insect species on mustard crop. Insect species were monitored at weekly interval. Five insect species namely, Aphid, White fly, Beetle and Painted bug were observed. It was observed that the colour of trap and time of sampling greatly influenced the number of insects captured in the different traps. Expect aphid all other insects' species found in large population at initial stages and later on decreased gradually. The yellow pan traps proved highly effective to capture predominantly more than half of total insects captured in all traps, and it was followed by green and black traps. The white fly was captured more than half of total insect population. Yellow pan traps attracted the greatest number of whitefly, aphid, painted bug and second large number of beetle. The black colored traps attracted painted bug in the highest number.

Key words: *Lipaphis erysimi* Kalt, *Bemisia tabaci* Gennadius, *Phylloretta cruciferea* Goeze and *Bagrada picta* Fabricius.

INTRODUCTION

Rape and mustard are the secondary largest contributors to the indigenous edible oil production, for about 30% share in the total. These are grown all over the country on an area of about 0.4 million hectare. (Rehman *et al.,* 1987). A numbers of insects' attack and cause serious damage to rape and mustard crops. This damage, combined with the reluctance of growers to apply expensive control measure adversely affect yield every year in Pakistan. In the absence of cheap alternative control methods, yield of rape and mustard are severely reduced. The main cause of lower yield is due to considerable lower cause by attack of insect pests.

More than three dozen insect pests are found on these crops (Rai, 1985). The most important are painted bug *Bagdara picta*, sawfly *Athalia proxima*, whitefly *Bemisia tabaci* Gennadius, and mustard aphid *Lipaphis erysimi* Kalt, The yield losses from the higher mustard growing areas ranging from 24.0 -95.0% (Srivastva *et al,* 1985). The actual crop loss from Pakistan has not been calculated, but the data from India, where rape and mustard are grown under near similar condition, show very alarming picture. Seed yield losses in India caused by aphids alone are estimated to be more than 60% for the *B. campestris*, and 30-60% for *B. juncea* cultivars. (Rehman *et al.,* 1987).

Infact the status of rape and mustard cannot be iterated without reducing these losses through the development and adoption of appropriate pest management practices based on integration of chemical, cultural and biological methods.

Monitoring in insect pest management can be used to determine the geographical distribution of pests or to assess the effectiveness of control measures, but in the widest sense it is process of measuring the variables required for the development and use of forecasts to protect pest out break (Conway, 1984). Such forecasts are important component of pest management strategies because a warning of the timing and extent of pest attack can improve the efficiency of control measures.

Central to any insect pest monitoring program is the sampling technique that is used to measure change in insect abundance. A great deal of research effort is directed at developing technique and device, particularly insect traps that may be used for monitoring. Research on insect traps provides an easy means by which amounts of apparently useful data can be obtained. A great deal of trap catch data have been collected and analyzed for many insect species, and various trap designs, placed at different position, using different lures and doses (David, 2000). Insect traps provide the most popular form of monitoring device for entomologists used as decision making tool. A field based sampling technique, which could be an insect trap, is used to collect data on local pest population changes in a

particular crop or field. This improvement is then used by the farmer to make decisions about the implement of control measures.

The effectiveness of trap depends to a large extent on its design, especially the design of mechanism for the insect capture or retention. Few studies have conducted to investigate the behavior of the insects that leads to differences in catches between trap designs as reported by (Timmons and Potter, 1991). Observation of approach behavior to the trap and the way in which the insects are caught may provide a more direct method for improving trap design as described by (Phillips and Wyatt, 1992). Various types of catches and traps are used as suction traps, sticky traps, light traps and water traps etc.

The water pan traps may be of glass, plastic or metal bowl containing water, detergent and preservative. These traps can be various colours, but few catching aphids are usually painted bright yellow (Taylor and Palmer, 1972). Several workers monitoring the insects' population through using different traps of different colours on different crops except mustard. Eichelkraut and Cardona, (1989) studied the biology of *Bemasia tabaci* on beans. They carried out ecological studies by yellow trap catches.

Water pan traps was also used to monitor aphids and *Cicadellidae* st different height in maize and suggested that insect activity is varied at height (Vega *et al.,* 1990). Trap colour effect of efficiency of water pan traps, when used for sampling of potato aphid (Boiteau, 1990). The mosaic green tile, water pan trap set many criteria but trapped as many species as the attractive yellow traps. Two types of green tile trap were also attractive to aphid and did not match the relative spectrogram of potato leaves above 650 mm. Nizamani *et al.,* (1991; unpublished personal communication) working on effects of trap colour size on relative efficiency of water pan trap for sampling aate aphids on wheat. They reported that yellow pan traps attracted the greatest number of aphids. The level of aphid catch per unit of surface area decreased with one unit increased in the size of trap.

No systemic studies on the effect of trap colours on relative efficiency of water pan traps for sampling the insect pests of mustard have been done. Therefore, the present studies were carried out to evaluate the effect of trap colours on relative efficiency of water pan traps for sampling of insects in the mustard ecosystem

MATERIAL AND METHODS

Twenty water pan traps of five different colours (four replications), circular in shape and of uniform size were used. The colours were yellow, white, green, blue and black. Pans were filled with 5% formalin. These water pan traps, at initial stage of crop, placed horizontally within the mustard field at ground surface. Afterwards water pan were placed on the wooden stand in the field at 1 meter height.

Insect species were trapped weekly at various sites in mustard field. They were taken singly by camel's hair brush from water pans, and were identified as mustard Aphid *Lipaphis erysimi*, Whitefly *Bemisia tabaci* Gennadius, Beetle *Phylloretta crucifera* Goeze, painted bug *Bagarda picta*, and some other species. Weekly counts for each insect species were made and recorded. Following parameters were determined:

i. The number of all insect species in each trap.
ii. The number of each insect species in each trap.
iii. The number of each insect species in all traps.
iv. The total number of insects in all traps in each week.

Sampling started on 12th of December 2011 and continued at weekly intervals upto 14th February 2012.

RESULTS

Experimental results showed great variation amongst traps in term of different insects species caught at weekly interval. The crop stage or times of sampling have also great effects on the number of insect caught.

Mainly four insects' species were found in the traps *i.e.* Aphid, *Lipaphis erysimi* Kalt, whitefly *Bemisia tabaci* Gennadius, painted bug *Bagrada picta* Fabricius and beetle *Phylloretta cruciferae* Goeze. Among these whitefly was always larger in number than others during the study period. The yellow pan traps captured greater insect pest (1439) followed by green and blue colour trap (240) each, than any of the other traps that we installed, which is more than half of the total insect pests capture in all traps (Fig. 1). The white coloured water pan traps captured lowest insect pest (149) during the sampling period. During first week of sampling the population of whitefly was high (Fig. 1) than other insects and also in higher than in other weeks (308), in second week the population of whitefly decreased to (255), and till gradually decreased by weekly intervals and became zero in the last week. The beetle population in the first week was found to be 26, but relatively higher in the second week of sampling (32), followed by 30 beetles in fifth week, and lowest population (4) occurred in 10th week. The aphid population

fluctuated in between the weeks. Greater number of aphids were captured in the eight week *i.e.* 129 followed by 86 aphids in seventh week and 80 aphids in last week. The lowest aphid population was found in second week (Fig. 2).

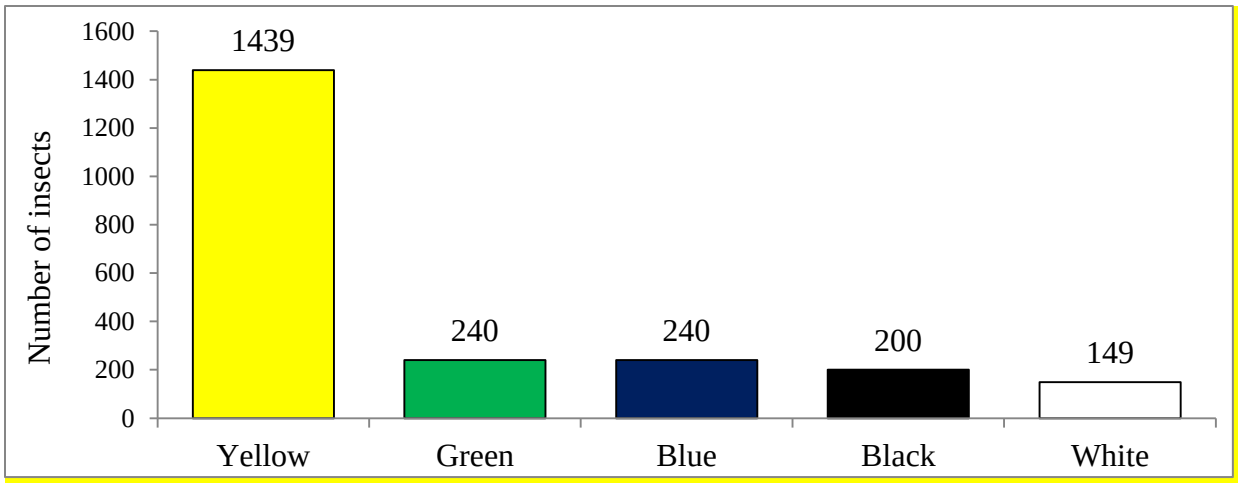

Fig. 1. Total number of insects captured by each type of trap.

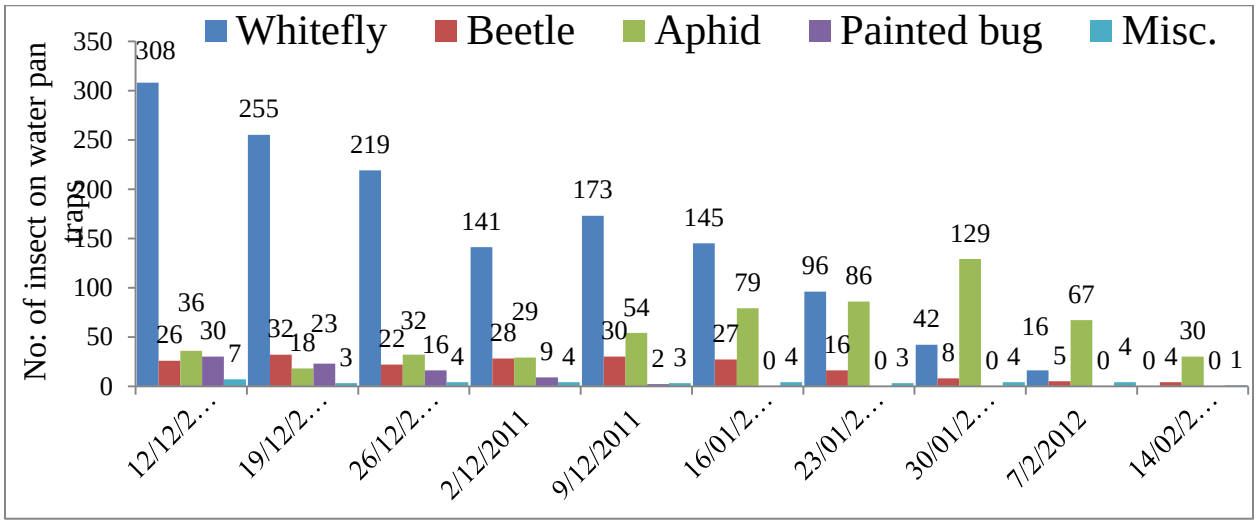

Fig. 2. Cumulative number of various insect species captured on different dates on coloured water pan traps in mustard field.

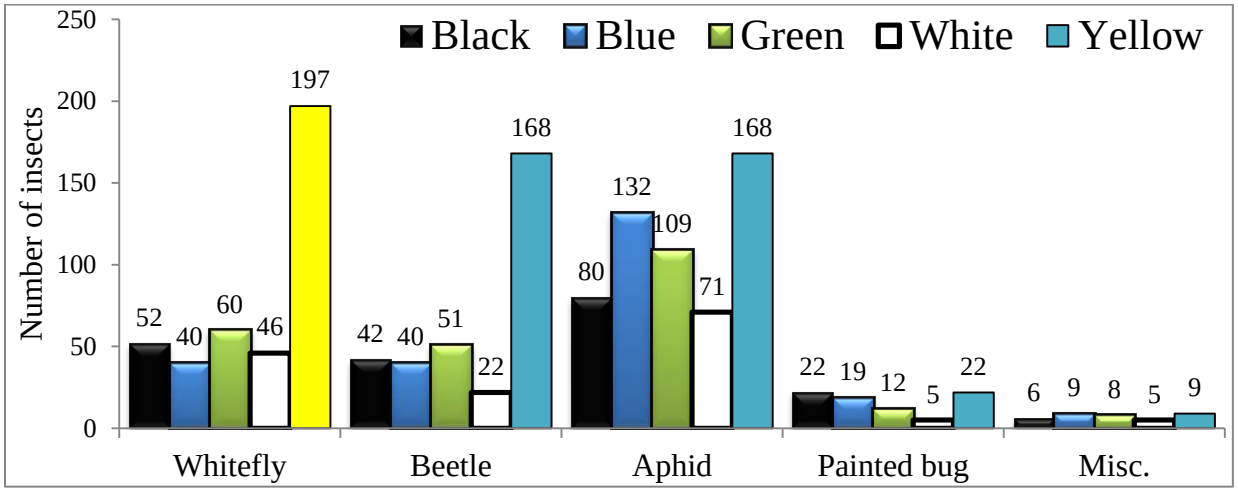

Fig. 3. Trap and insect interaction.

The high population of painted bug occurred in first week (30) which became zero in sixth week and remains so up to the end (Fig. 2). It was clear from Fig. 2, that in the early stage of the crop, the population of whitefly, beetle and painted bug was captured with high number and that gradually decreased, but aphids is greater when crop completed more than its half period (Fig. 2).

Most insect species were present with high level at early stages and later on gradually decreased expect aphid whose population reached to be highest in the eighth week.

The yellow coloured water pan trap was most effective to capture insects including whitefly, beetle, aphid and painted bug (Fig. 3). In case of whitefly yellow coloured traps was highly effective captured about half of the total whitefly, followed by green (Fig. 3). For beetles and aphids the yellow pan was also highly effective. The second large numbers of aphids were captured in blue followed by green. About half of the total beetle captured in yellow pan followed by green pan. In case of painted bug the yellow and black traps were most effective followed by the blue (Fig. 3).

DISCUSSION

Field experiment was conducted in the mustard field during the month of December-February, 2011-12 to determine the sampling efficiency of water pan traps of different colours against the various insect pests found in mustard field. Monitoring of the insects by using different traps on various crops was also recorded by many workers such as (Goemen, 1987; Eichelkraut and Cardona, 1989; Mustufa and Hamdan, 1989; Evans, 1991). During the experiment four major pests were found in the mustard field *i.e.* whitefly, aphid, painted bug and beetle. About the same species were also reported by Rai (1976) studying the most important insect pest of rape and mustard (*Brassica juncea*). From the field trails it was observed that the yellow water pan trap was most effective that captured maximum number of insects followed by green and blue coloured traps. The similar results have been reported by Rao (1989) working in Andhra Pradesh India and found that yellow sticky traps were suitable for monitoring *Bemisia tabaci* on cotton as well as Boiteau (1990) worked on the comparisons of four different green, horizontal, water pan traps to monitor aphids on potatoes. The whitefly population was significantly greater than all other insects followed by aphid. It was also observed from this study that population of all insects species were high at initial stages of the crop except aphid and then gradually decreased. It was also obvious from our experiment that trap colour and time of the sampling was greatly interfered the results. The results obtained from this study also indicated that yellow colour attracted the great number of insects as the yellow colour attracted the great number of insects as compared to all other colour trap. Similar observation was reported by (Nizamani *et al.*, 1991 unpublished personal communication) who compared horizontal water pan traps of four different colours. They reported that yellow pan traps attracted the greatest number of aphid and meet the criteria for an ideal trap. Perrella (1991) worked on biological control of whitefly (*Bamasia tabaci*) and used yellow traps.

Our results showed that traps colour and time of sampling were the two most important factors that influenced the number of insects captured. The similar findings have been reported by (Nizamani *et al.*, 1991 unpublished personal communication; Bottenbergs and Irwan, 1992).

REFERENCES

Boiteau, G. (1990). Effect of trap color and size on relative efficiency of water-pan traps for sampling alate aphids (Homoptera: Aphidedeae) on potato. *J. Econ. Entomol*., 83: 937-942.

Bottenberg, H. and M.E. Irwin (1992). Canopy structure in soybean monocultures and soybean- sorghum mixture: Impact on aphid (Homoptera: Aphidedeae) landing rates. *Envrion. Entomol*., 21(3): 542-548.

Conway, G.R. (1984). Tratical models. In: Conway, G.R. (ed). *Pest and pathogen control, radical strategies, tratical and policy models*. John wiley and sons, chichester. pp. 5-28.

David, D. (2000). *Insect pest management*, 2nd Edition. CABI Publishing, UK

Eichelkraut, K. and C. Cardona (1989). Biology, mass rearing and ecological aspects of the whitefly *Bemisia tabaci* (Gennedius) ((Homoptera: Aleyrodidae), as a pest of beans. *Turrivaable*, 39(1): 55-62.

Evans, K.A., L.J. Allen-williams and I. Simpkin (1991). Response of cabbage seed weevils (*Ceuthorhynchus assimilispayk*) to rape plant odour in the field and the laboratory Cruciferae. *News letter*, 14-15, 158-159. School of Natural Science, Hat field Polytechinc, UK.

Goemen, H., E. Sekeroglu and A.F Ozgur (1987). Effectiveness of different installation heights and position of yellow sticky traps for catching whiteflies (*Bemisia tabaci* (Genn.) (Homopter: Alerodidae) on cotton. *Turikye I. Entomoloji Kongresi Bildireri*, *Ekim* 13-16.

Mustafa, T.M. and A.S. Hamdan (1989). Flight activity of short tailed almond aphid, *Brachycaudus amygdalinus* in the central highlands of Jordan (Homoptera: Aphididae). *Bollettino della societa Entomologica Italiana*, 121(3): 176-180.

Nizamani, S.M. A.S. Buriro, R.D. Khuhro, G.M Rahoo and Q.D Abbasi (1991). Effect of trap colour and size on relative efficiency of water pan traps for sampling alete aphids (Homoptera: Aphelinidae) on wheat. (Personnel communication).

Perrella, M.P., I.D. Paine, J.A. Bthke, K.L. Robb and J. Hall (1991). Evaluation of Encarsia formosa (Homoptera: Aphelinidae) for biological control of sweet potato whitefly (Homoptera: Alerodidae) on Poinsettia. *Environ. Entomol*., 20(2): 713-719.

Phillips, A.D.G. and T.D. Wyatt (1992). Beyond origami: wing behavioral observations as a strategy to improve trap design. *Entomologia Experiments et Applicate* 62(1): 67-74.

Rai, B.K. (1985). Pest of oilseed crop of india and their control. pp. 413-422. In: *Oilseed Production. Constaints and opportunities* (Editor Srivastava, H.C., S. Bhaskaram, B. Vatsya and K.K.G. Menon. *Oilseed production constraints and opportunities*. Oxford and IBH Publishing Compay, New Delhi.

Rao, N.V., A.S. Reddy and K.T. Rao (1989). A method to moniter whitefly (*Bemasia tabaci*) in cotton (*Gossypium hirsutum*). *Indian J. Agric. Sci.*, 59 (7): 459-461.

Rehman, A., K. Khan, M. Munir and M.A. Yousuf (1987*). Rape and Mustard in Pakistan*. 1-19.

Srivastava, H.C., S. Bhaskaram, B. Vatsya and K.K.G. Menon (1985). *Oilseed production constraints and opportunities*. Oxford and IBH Publishing Compay, New Delhi.

Taylor, L.R. and J.M.P. Palmer (1972). Arial sampling. In: *Applied aphid technology* (ed. by H.F. Van Emden). Pp.189-234.

Timmons, G.M. and D.A Potter (1991). Influence of pheromone trap colour on capture of lilac borer males. Environmental entomology 10, 576-579.

Vega, F.E., P. Barbosa and A.P. Panduro (1990). An adjustable water pan trap for simultaneous sampling of insects at different heights. *Florida-Entomologist*, 73(4): 656-660.

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