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*RESEARCH NOTE*

# COMPARATIVE EFFECT OF DIFFERENT PLANT EXTRACTS AND INSECTICIDE APPLICATION AS DUST TO CONTROL THE ATTACK OF RED PUMPKIN BEETLE ON CUCUMBER

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**ABSTRACT: Studies on the comparative effect of different plant extracts (neem seed, neem leaves and tobacco leaves) and insecticide permethrin dust alone or mixed with dung, were conducted against red pumpkin beetle in the field at National Agricultural Research Centre, Islamabad during *kharif* 2008. Permethrin (0.5%) alone or mixed (0.05%) with dung ash as dust controlled the attack of red pumpkin beetle on the crop with no mortality of plants. Highest mortality of plants due to foliage eating by red pumpkin beetle was observed in control where no permethrin was applied. None of the plant extracts tested in this study as dust alone or mixed with dung ash was effective in controlling red pumpkin beetle attack. Permethrin dust (0.5%) alone and ash + permethrin dust (2000: 1 a.i w/w) gave a significantly higher yield of 18.07 and 18.63 t ha$^{-1}$ in cucumber, respectively.**

*Key Words: Cucumber; Plant Extract; Control; Red Pumpkin Beetle; Pakistan.*

## INTRODUCTION

Red pumpkin beetle, *Aulacophora (Raphidopalpa) foveicolis (Lucas)* is the most destructive pest of cucurbit crops particularly in early stage of the crop, and some times, the attack is so severe that the crop has to be resown due to complete defoliation of plants (Rajak, 2000; Parsad and Kumar, 2002; Mahmood et al., 2005). Singh et al. (2000) studied the host preference of red pumpkin beetle on different cucurbit crops and reported cucumber as medium in preference. Two more species are reported to attack cucurbit crops in Indian subcontinent (Nayar et al., 1996), *Aulacophora atripenmis* is blue in colour and *A. maxima*, is yellow with black border. Rajak and Singh (2002) reported that insecticides were significantly effective over control and among plant leaf powder, neem (*Azadirachta indica)* was the most effective followed by bakayen (*Melia azadarich*). Neem has been reported as the most promising source of biopesticides compared with onion and garlic when tested against insects (Singh and Saratchandra, 2005). Eight different treatments including insecticides and non-insecticides against red pumpkin beetle on cucumber crop during *kharif* season were tested. Transplanting of seedling at 4-5 true leaves stage was found an effective method to avoid red pumpkin beetle attack (Mahmood et al., 2006). The polyethylene cages protected cucumber seedlings effectively against infestation by red pumpkin beetle attack for up to one month after germination (Chaudhary, 1995).

In Pakistan, cucurbit crops i.e., muskmelon, long melon, cucumber, water melon, bottle gourd, bitter gourd, tinda gourd and sponge gourd etc are being grown over a large area and red pumpkin beetle is also a serious pest. Therefore, it was desirable to compare the effectiveness of different plant extracts and permethrin as dust against red pumpkin beetle on cucumber crop.

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## MATERIALS AND METHODS

The plant parts (neem seed, neem leaves and tobacco leaves) were crushed in a grinder (Braun AG Frankfurt/M Type: MX 32) and passed through a sieve of size (1mm x 1mm). The powder thus obtained was used alone and also mixed with carrier (dung ash). There were ten treatments i.e. tobacco powder, neem seed powder, neem leaves powder, tobacco powder + ash (1:3 w/w), neem seed powder + ash (1:3 w/w), neem leaves powder + ash (1:3 w/w), dung ash alone, permethrin dust 0.5 %, ash + permethrin dust (2000: 1 a.i w/w) and control (without any pesticide treatment).

The experiment was conducted in the field at National Agricultural Research Centre, Islamabad, Pakistan during 2008. It was laid out in randomized complete block design with three replications using cucumber cv. Sialkot Selection. The bed size was 4m x 1.5m. Planting was done on both sides of the bed with plant to plant distance of 0.50 m. Sowing was done on March 15, 2008. Farm yard manure was applied @ 30 t $ha^{-1}$ and NPK @ 100:50:25 kg $ha^{-1}$. Whole of P, K and half of N was applied during soil preparation and remaining half of N was applied in two equal doses after fruit pickings.

After germination, all plant extracts/ insecticide for each treatment were applied four times as a dust at weekly interval. Number of plants which are completely defoliated due to leaf eating of plants by red pumpkin beetle within 35 days after germination of crop were recorded in each treatment. The yield was also recorded in each treatment. The yield obtained in treatment (ash + permethrin 0.05% w/w) was used as a bench mark yield to calculate the yield loss in treatment by using following formula:

$Yl = Yp - Yt$

where,

Yl = Yield loss (t $ha^{-1}$)

Yp= Yield obtained (t $ha^{-1}$) in ash + permethrin dust (2000: 1 a.i).

Yt= Yield obtained (t $ha^{-1}$) in respective treatment.

The data were collected and treatment means were subjected to analysis of variance (Steel and Torrie, 1980). Least significance difference (LSD) was used to compare the means of treatments.

**Table 1. Comparative effect of different plant extracts and chemical application as dust in avoiding plant mortality by red pumpkin beetle on cucumber**

| Treatment | % of plant mortality (foliage eating) by red pumpkin beetle up to 35 days after germination | Fruit yield (t $ha^{-1}$)* | Fruit yield loss (t $ha^{-1}$) as compared to Ash + permethrin dust 0.05% |
|---|---|---|---|
| Tobacco powder | 55.56 | 11.52 | 7.12 |
| Neem seed powder | 83.33 | 2.63 | 16.00 |
| Neem leaves powder | 61.11 | 6.42 | 12.22 |
| Tobacco powder + ash (1:3 w/w) | 38.88 | 9.00 | 9.63 |
| Neem seed powder + ash (1:3 w/w) | 77.78 | 6.67 | 11.97 |
| Neem leaves powder + ash (1:3 w/w) | 50.00 | 6.50 | 12.13 |
| Dung ash alone | 55.56 | 10.00 | 8.63 |
| Premethrin dust 0.5% | 0.00 | 18.07 | 0.56 |
| Ash + permethrin dust (2000: 1 a.i w/w) | 0.00 | 18.63* | 0.00 |
| Control (No application) | 80.00 | 2.50 | 16.13 |
| LSD Value | 31.69 | 6.308 | 6.137 |

**Benchmark yield for estimation of fruit yield loss.*

## RESULTS AND DISCUSSION

Permethrin (0.5%) alone or ash + permethrin dust (2000: 1 a.i) as dust saved the crop and there was no mortality of plants due to leaf eating by red pumpkin beetle attack. Highest mortality of plants (80%) due to foliage eating by red pumpkin was observed in control where no application of dust insecticide extract was made (Table 1). These findings are in agreement with previous reports that red pumpkin beetle is a serious pest of cucurbits particularly in early stage of the crop growth and some times, the attack is so severe that the crop has to be re-sown (Rajak, 2000; Parsad and Kumar, 2002; Mahmood et al., 2005 ). None of the plant extracts tested in this study as dust alone or mixed with dung ash was found effective in controlling red pumpkin beetle attack and no significant difference was found between control and treatments where plant extract as dust alone or mixed with dung ash was applied. Therefore none of the plant extract tested in this study is recommended as an alternate to organic method of controlling red pumpkin beetle. These results are not in agreement with the finding of Rajak and Singh (2002) who claimed that plant leaf powder, neem (*Azadirachta indica )* was the most effective followed by bakayen (*Melia azadarich*) against red pumpkin beetle. Use of dung ash alone was not effective against red pumpkin beetle which also confirmed our previous findings (Mahmood et al., 2006*).* As the application of permethrin (0.5%) alone or ash + permethrin dust (2000: 1 a.i) produced no plant mortality due to complete foliage eating by red pumpkin beetle, therefore, significantly higher yields (18.07 and 18.63 t $ha^{-1}$) were obtained in these treatments as compared to others. Although many insecticides have been recommended for effective control of red pumpkin beetle (Rajak and Singh, 2002; Mahmood et al., 2006*),* yet the finding of current studies is very important as mixture of ash + permethrin dust (2000: 1 a.i) is effective which can significantly reduce the pesticide quantity per unit area. Analysis of variance of data is given in Table 2.

Fruit yield loss was highest (16.13 t $ha^{-1}$) in control as compared to that of ash + permethrin dust (2000: 1 a.i) which was used as a bench mark yield. Yield loss in most of the plants extracts used in this study was non-significant with control which gave another evidence that plant extract used in this study either alone or mixed with dung ash are not effective to avoid plant mortality by red pumpkin beetle. Therefore, mixture of ash + permethrin dust (2000: 1 a.i) is recommended for its effectiveness against red pumpkin beetle and this method also reduces the pesticide burden per unit area.

**Table 2. ANOVA of different parameters studied**

| Source | Sum of squares | df | Mean square | F | Probability |
|---|---|---|---|---|---|
| Mortality %age | | | | | |
| Plant extracts | 24273.554 | 9 | 2697.062 | 7.9029 | 0.0001 |
| Replicates | 220.115 | 2 | 110.058 | 0.3225 | |
| Error | 6142.937 | 18 | 341.274 | | |
| Total | 30636.606 | 29 | | | |
| Fruit yield | | | | | |
| Plant extracts | 849.354 | 9 | 94.373 | 6.9794 | 0.2727 |
| Replicates | 37.801 | 2 | 18.901 | 1.3978 | 0.0003 |
| Error | 243.389 | 18 | 13.522 | | |
| Total | 1130.544 | 29 | | | |
| Yield loss | | | | | |
| Plant extracts | 806.867 | 9 | 89.652 | 7.0034 | 0.0415 |
| Replicates | 97.751 | 2 | 48.876 | 3.818 | 0.0002 |
| Error | 230.423 | 18 | 12.801 | | |
| Total | 1135.041 | 29 | | | |

It is therefore concluded that none of the plant extracts tested in this study as dust alone or mixed with dung ash was found effective in reducing the red pumpkin beetle attack. However, permethrin (0.5%) alone or ash + permethrin dust (2000: 1 a.i w/w) saved the crop and controlled the attack of red pumpkin beetle on the crop with no mortality of plants. As ash + permethrin dust (2000: 1 a.i) reduced the insecticide use per unit area therefore it is recommended for use against red pumpkin beetle.

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