SUMMARY

Under the present investigation, the tests insect red pumpkin beetle, *Raphidopalpa foveicollis* Lucas (Coleoptera; Chrysomelidae) is the serious pest, causing enormous qualitative and quantitative losses to various cucurbits vegetables, particularly, pumpkin, *Cucurbita maxima*, vegetable sponge, *Luffa cylindrica*, *Luffa acutangula*; Musk melon, *Cucumis melo*; round guard, *Citrulas vulgaris* Var. *Fistulosis* and cucumber, *Cucumis sativus*. The efficacy of eight indigenous plant extracts viz., leaves of *Ocimum basilicum* Linn, *Ocimum canum* Sims, *Pogostemon heyneanus* Bth., *Salvia officinalis* Linn., *Coleus amboinicus* Lour, and aerial part of *Mentha longifolia* (L) Huds., *Mentha piperita* Linn. and *Mentha spicata* Linn. with control (benzene + emulsified water) were tested to find out their comparative bioefficacy. Antifeeding, repellent and insecticidal effects were worked against third instar grubs and adults of *R. foveicollis* under laboratory and field conditions which are discussed as under: -
1) **Antifeeding Test:**

The five square cm. area of pumpkin leaves were cut and dipped in the different concentrations ie. 0.25, 0.50, 1.00, 1.50, 2.00 per cent of the extracts. The leaf pieces fastened under clip and left under electric fan for about thirty minutes, so as to complete dry up the extract. In each set of extract, one control was kept in which the leaf pieces were dipped in Benzene + emulsified water only. The treated pieces were kept in petridishes on moist filter papers and two 3rd instar 24 hours starved grubs and adults of *R. foveicollis* were released in each petridish to feed for 24 hours. The area consumed by the grubs and adults in each replication was measured with the help of “Plainimeter”. All the comparisons were made with control. Three replications of each treatment were done.

The result of antifeeding test and relative protectivity of selected plant extract against third instar grubs and adults of *R. foveicollis* are summarized. It is evident that *C. amboinicus* was more effective and *S. officinalis* the least. On the basis of
their order of merit and EC$_{50}$ antifeeding result is summarized as under viz., $C.\ amboinicus > M.\ piperita > P.\ heyneanus > M.\ longifolia > M.\ spicata > O.\ canum > O.\ basilicum > S.\ officinalis$ and the order of merit being: $0.013 > 0.018 > 0.141 > 0.213 > 0.375 > 0.452 > 0.477 > 0.626$, times more protective, respectively as $C.\ amboinicus$ taken as unit.

2) Repellent Test:

For testing the repellent efficacy, five square cm. area of pumpkin leaves were cut and dipped in the different concentrations of the extracts. The leaf pieces fastened under clip and left under electric fan for about thirty minutes, so as to complete dry up the extract. In each set of extract, one control was kept in which the pumpkin leaf pieces were dipped in Benzene + emulsified water only. The treated food was kept in jar (23cm x 10cm) on moist filter paper. Then ten, third instar, 24 hours starved grubs and adults of red pumpkin beetle, $R.\ foveicollis$ were released in each jar, respectively. In each set of extract and one control (Benzene + emulsified water) was
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introduced. Three replication of treatment were made. The data was collected on the number of grubs and adults reached at each treated food after four hours of the release.

In the present investigation, relative repellency of selected indigenous plant extracts against third instar grubs and adults of *R. foveicollis* are analyzed. It is seen in that *S. officinalis* was proved to be the best repellent against third instar grubs and adults of *R. foveicollis*. All plant extracts have been shown in following order on the basis of their respective Ec50 values as: *S. officinalis > O. basilicum > O. canum > M. spicata > P. heyneanus > M. longifolia > C. amboinicus > M. piperita* and the order of merit being: 0.097 > 0.102 > 0.117 > 0.136 > 0.145 > 0.147 > 0.741 > 0.815, respectively, where as *M. piperita* was taken as an unit.

Thus, considering the various aspects, it is obvious that so many plant extract tested for their repellent properties against the grubs and adults of *R. foveicollis* of which is the serious pest of vegetable crops, are not sufficient. Thus, the results
obtained from the present investigations are in quite conformity with those workers, who have reported earlier in the support the antifeeding and repellent actions of plant extracts.

3) Insecticidal Test:

Experiments were carried out under laboratory conditions. The third instar grubs and adults of *R. foveicollis* were used for the purpose. The insecticides of the plant origins were tested by dry film technique. The spraying of the insecticides was done in glass petridishes (10cm diameter) by potters spray tower, using 1.0 ml. of solution (insecticidal preparation) per petridish. Three concentrations ie. 0.5, 1.0 and 2.0 percent were tested in three replications, along with over control (Benzene + emulsified water). To record the mortality, the spray petridishes were gently shaken under an electric fan till the liquid phase evaporated leaving behind a uniform dry film of insecticide on the glass surface. The spray tower was thoroughly rinsed with the insecticide solution. Ten grubs and adults of *R. foveicollis* of known age were then released inside each pair of petridishes.
and allow remaining there up to two hours. After which, they were transferred to the fresh petridishes containing fresh food for feeding.

In the test of insecticidal effect, the effectiveness of all eight plant extracts were tested under laboratory and field conditions against the third instar grubs and adults of *Raphidopalpa foveicollis*. The laboratory and field approaches provided a useful method by which, many extracts in different concentrations were compared under identical conditions of the grubs and adults of *Raphidopalpa foveicollis*. The same are being discussed as under:

At different concentrations and different periods, all the eight selected plant extracts were found to possess more effective to the grubs and adults of *R. foveicollis*, when compared with the control (Benzene + Emulsified water). It is thus; evident from the results obtained in this study that extract of *Coleus amboinicus* was highly effective and gave promising insecticidal activity.
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The insecticidal results reveals that the plant extract of *Coleus amboinicus* gave the maximum mortality to grubs and adults of *R. foveicollis*. It killed 80.86 per cent grubs and adults of *R. foveicollis* followed by *Mentha piperita* (72.83 per cent), *Pogostemon heyneanus* (67.90 per cent), *Mentha longifolia* (66.80 per cent), *Ocimum canum* (65.70 per cent), *Mentha spicata* (64.82 per cent), *Ocimum basilicum* (64.16 per cent), *Salvia officinalis* (59.63 per cent), respectively. The plant extract of *Coleus amboinicus* differed significantly from remaining once except from *Mentha piperita* and *Pogostemon heyneanus*, which it does not differs significantly to one another.

It is also observed that the difference in the percentage kill of grubs and adults in concentration 2.0 per cent and 1.0 per cent is greater than the difference in concentration to kill the grubs and adults of *R. foveicollis* in 1.0 per cent and 0.5 per cent in all the three periods. Similarly the difference in percentage mortality of grubs and adults of in 6 hours and 12
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hours is greater than the difference in percentage mortality in the period of 24 hours.

b) Field Experiment:

For contact toxicity test, the fresh leaves of pumpkin were taken from unsprayed field and washed thoroughly with tap water. The each leaf was dipped into desired concentration of each extract and dried under the fan, then kept them into petridishes (15 cm in diameter) separately. A control with Benzene + emulsified water was run simultaneously. Now, ten known healthy grubs and adults of *R. foveicollis* were released into each petridishes after drying the extract of treated leaf. The mortality of the grubs and adults of *R. foveicollis* were counted after 24, 48, 72 hours of the released.

All the concentrations at three different periods differed significantly to one another and found to be more toxic to the grubs and adults of *R. foveicollis* when compared with control (Benzene, Emulsified water) on pumpkins vegetable.
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In field experiments the toxicity of eight Lamiaceous bioactive botanicals was calculated summarized. Based on their relative mortality and transformed back values the results in decreasing order are as: *Coleus amboinicus* 74.26 (92.26) > *Pogostemon heyneanus* 67.12 (84.9) > *Mentha piperita* 66.20 (83.7) > *Ocimum canum* 65.67 (83.1) > *Mentha spicata* 63.28 (79.8) > *Coleus amboinicus* 60.90 (76.3) > *Ocimum basilicum* 60.75 (76.1) > *Mentha longifolia* 56.49 (69.5) > *Salvia officinalis* 50.26 (59.1) > control 12.22 (04.5), respectively.

It is evident from the above results that plant extract of *Coleus amboinicus* gave the best results when compared with the other selected lamiaceous products. It killed 74.26 per cent of grubs and adults followed by *P. heyneanus* (67.12 per cent).

The insecticide *Coleus amboinicus* differs from significant remaining once except *P. heyneanus* and *Mentha piperita*, which does not differ significantly to one another. *Salvia officinalis* proved least toxic giving only 50.26 per cent
mortality of the grubs and adults *R. foveicollis*-vivo experiments.

It is thus, apparent from the results that out of eight plant extracts tested as insecticide under the laboratory conditions against third instar grubs and adults *R. foveicollis*, only *C. amboinicus* (74.26 percent), *P. heyneanus* (67.12 percent) and *M. piperita* (66.20 percent) gave significant mortality. Thus, the results obtained in the laboratory insecticidal trials appear to be at par of those workers who have reported earlier. Overall, in the laboratory and field experiments, the extract of *C. amboinicus*, *P. heyneanus* and *M. piperita* were promising herbal insecticides and quite superior to the remaining extracts.

Hence, it can be concluded from the results obtained that the reduction of the grubs and adults of *Raphidopalpa foveicollis* may be due to the strong antifeeding activities of *C. amboinicus*, *M. piperita* and *P. heyneanus* and insecticidal properties of *Coleus amboinicus*, *Pogostemon heyneanus* and...
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*Mentha piperita*, the extracts, where as *S. officinalis* and *O. basilicum* extract showed highest repellency. No physical injury was noticed on any part of the plant after spraying. During the spraying of the extract it was noticed that extracts gave a strong irritating and unpleasant odour. The above selected plants extracts and can be used on cruciferous plants and vegetables very well against the damaging insects as an alternative to synthetic insecticides.