

SUMMARY AND CONCLUSION

The public anxiety about environmental pollution has made the side effects of pesticides, one of the principal research activities of biologists since 1962. Later on number of laboratories were engaged in understanding the various mechanisms within the plants and animals by which are able to withstand environmental extremities. Response of plants to environmental stress also varies with the time scale. Stress problems viz. water stress, salt stress and environmental stress including pesticide residue problem is greatly debated subject amongst the researchers. Though pesticides protect vegetables, fruits and food grains right from the seed stage through germination to growth and then to storing, their use has many consequences and from studies of many pesticides, the conclusion has been reached that they can induce considerable damage into human gene pool. Recent studies on cyto and chromotoxic effects of agro and environmental chemical and their possible genotoxic effects have prompted several international agencies to recommended the screening of mutagenic and chromotoxic effects of almost all the chemicals being used commercially. Moreover most of the pesticides have been shown to cause toxic effects on plants in various ways. Changes in physiological metabolism in response to different stresses take place in a matter of hours or so. Ultimately plant growth, is affected through stomata, cell behaviour, leaf activity or tissue development. Similarly water status of the plant is also affected by these different types of stresses. Possibly pesticidal stress is no exception for this. The work

discussed in this dissertation therefore, is an impact of organophosphorus pesticides on some physiological parameters such as leaf area expansion, relative water content, stomatal behaviour, organic and inorganic constituents and residual persistence in vegetable crops like tomato, okra and guar. It is hoped that this work will provide the input of fundamental knowledge necessary for developing plant-pesticide relationship.

Method of approach :

The plants were raised in an earthen pots and were allowed to establish for one month. Then they were subjected to pesticidal treatment by employing foliar application upto runoff point. The pesticides used for foliar application are methylparathion and phosphamidon. The concentrations selected for foliar spray were below, at and above recommended doses. The plant tissue was analysed on 1st, 2nd, 4th and 7th day after spraying for different physiological parameters. Dried plant material was used for analysing inorganic constituents like Na^+ , K^+ , Ca^{2+} , Mg^{2+} , Fe^{2+} , Mn^{2+} , Zn^{2+} , and Cu^{2+} . Residual persistence in tomato plant, both in leaves and in fruits was studied by employing paper chromatographic and thin layer chromatographic technique.

The results are discussed under the light of available up-to-date literature and the effects are investigated in the following ways.

Effect of methylparathion and phosphamidon on :

- (1) Leaf area expansion
- (2) Relative water content
- (3) Stomatal regulation

- (4) Organic constituents
- (5) Inorganic constituents
- (6) Residual persistence.

Conclusions :

- (1) Phosphamidon at lower concentration helps in increasing the leaf area, whereas higher concentration reduces it.
- (2) Methylparathion favours growth at below recommended dose (0.1%) while phosphamidon favours at recommended dose (0.04%).
- (3) Lower concentrations of both these insecticides favour the water intake while higher concentrations do not.
- (4) The data on diffusive resistance and transpiration rate, with the increasing concentration of methylparathion indicate the stomatal closure in response to insecticidal spray.
- (5) The normal behaviour of stomatal regulation is attained on 5th day after spraying. This situation holds good for both the insecticidal spray.
- (6) The diffusive resistance for CO_2 calculated by using the formula given by Jarvis (1971) indicates that there is a constraint in the event of gaseous diffusion process in the pesticide sprayed plants.
- (7) Amongst tomato, okra and guar, the stomatal regulation observed in case of guar is not much fascinating as that observed in other two crops.

- (8) The possible constraint in the event of CO_2 exchange can be correlated with the persistence of residual level left over the leaf surface.
- (9) Among the two pesticides studied, methylparathion appeared more effective in increasing diffusive resistance in okra plant.
- (10) Lower concentrations of both the insecticides stimulate chlorophyll synthesis while higher concentrations inhibit it.
- (11) With the increasing concentrations of both the insecticides polyphenol content is found to be increased.
- (12) Since both the insecticides highly decompose in alkaline medium, the analysis of sugars and starch by using alkaline copper tartarate reagent questions the suitability of analysing the carbohydrate content by this method. This requires further experimentation.
- (13) In case of both the insecticides, the concentrations which are below the recommended doses favour reducing sugar content in all the three vegetables.
- (14) Among the three concentrations used, 0.15% methylparathion is favourable for Na^+ uptake in guar plants.
- (15) Phosphamidon (0.02%) and methylparathion (0.1%) favour K^+ uptake in all the three vegetables studied.
- (16) No consistency is seen in Ca^{2+} uptake in all the plants sprayed with above recommended dose.
- (17) None of the concentrations of phosphamidon favour Mg^{2+} uptake in guar.

- (18) The response of Fe^{2+} uptake to methylparathion is better than that of phosphamidon.
- (19) Okra and tomato plants are not able to cope up easy uptake of Mn^{2+} under pesticidal influence.
- (20) No much difference is noticeable in the uptake of zink under the influence of both the insecticides in all the three vegetables studied.
- (21) Amongst the three vegetable crops studied, Cu^{2+} uptake is found maximum in guar under the influence of pesticides.
- (22) The maximum residual content is found on 1st day after spraying in both fruit and leaf extracts.
- (23) The residual content after 7th day of spraying is more in leaf than that of fruits.
- (24) Both methylparathion and phosphamidon show similar trend of their residual persistence when sprayed on tomato plants.
- (25) Though the residual content after 7th day of spraying is less, its quantification by using more sophisticated equipments is alarmingly important.

The overall message of this dissertation is that, the widely used organophosphorus insecticides viz. methylparathion (metacid-50) and phosphamidon (dimecron) though are unfavourable at higher concentrations as a foliar spray, they are useful at the lower concentrations as far as

physiological parameters are concerned. From agronomic point of view present investigation also convey that organophosphorus insecticides should always be used either in the recommended concentrations or in the below recommended concentrations for tomato, okra and guar plants. Little ignorance in the use of concentrations above the recommended doses may seriously affect the plant metabolism and will cause environmental pollution by persisting residual problem. Further study in detail to probe into plant-pesticide relationship is of utmost importance, which needs further investigation.