

**Circular No. 136**

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**COMPATIBILITY BETWEEN AND AMONG-PESTICIDES,  
INORGANIC FERTILIZERS AND PESTICIDES & INORGANIC  
FERTILIZERS FOR FOLIAR APPLICATION IN TEA**

**BANGLADESH TEA RESEARCH INSTITUTE**  
SRIMANGAL-3210, MOULVIBAZAR  
An Organ of  
**BANGLADESH TEA BOARD**  
171-172, BAIZID BOSTAMI ROAD  
NASIRABAD, CHITTAGONG



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### **Introduction**

Pesticides and chemical fertilizers are important inputs of tea production. Fertilization has a marked effect on the growth of tea as well as on the pest infestation. It is emphasized that a balanced nutrition in a crop will minimize the pest incidence, while the fertility level and an imbalanced fertilization may act as the pre-disposing factors for the incidence or infection of many pests and diseases. In early or mid part of the cropping season pest attack increases, at the same time foliar fertilization may also be necessary to encourage the plant growth. Application of pesticides requires huge labours, spraying equipments and vast quantity of water. On the other hand foliar fertilizer application also requires so much labours and knapsack sprayers. To organize separate applications of pesticides and fertilizers involves huge costing. But if two processes can be integrated without any negative effect, will save costs, labours and time.

To save costs, time and expenditure, planters are sometimes interested to apply both of them in combination for achieving the maximum benefit without affecting their final product- the crop at the end.

This could be the best achieved by knowing the nature of each chemical, their mode of action, efficacy, compatibility and judicious application. Sometimes, pesticides sprayed in combination with fertilizer enhance the efficiency of pesticides. In case foliar application a mixture of more than one fertilizer is also applied to reduce the additional expenditure of foliar application. Planters usually combine fungicides, insecticides and foliar nutrients in a single tank mix to reduce spraying time and cost.

Information about their real compatibility is often very scarce. During preparation of mixture if compatibility is not considered there may be adverse affect on the plant which may damage the tea plants and decline production. Pesticides are not always compatible with each other or with the water or liquid fertilizer carrier. Lack of compatibility may result only in the formation of a gel, precipitate, or sludge that plugs up screens and nozzles. But extreme incompatibility may produce a settling out of material that can harden like concrete in the bottom of the tank and in hoses, pumps, and other internal parts of the sprayer. The result may be a total loss of the pesticide and use of the sprayer. Incompatibility also can reduce effectiveness or cause crop injury. In tank-mixing several pesticides, although convenient, may create other problems. Foliar activity may be enhanced and result in crop leaf burn, or the activity of one or more of the pesticides may be reduced ("antagonism"). So, it is important to know the behaviour of these chemicals singly and in combination with others be

it a fertilizer or pesticide before working out any application programme. From this point of view, attempt has been taken to create awareness for the appropriate management the compatibility of fertilizers, pesticides and pesticides with fertilizers in this circular. This will help assist planters' in making rational and judicious use of pesticides and fertilizers efficiently.

### **Concept of the practice**

Chemical control has been a dominating feature in pest control in tea and passed through three generation of pesticides. Pesticide will continue to play a vital role in pest control programme in the foreseeable future. To combat pests and diseases, a wide array of pesticides including organochlorine, organophosphate, carbamates and synthetic pyrethroids are being used in tea plantation in Bangladesh. The correct choice of pesticides, dosage, timing and method of application are of paramount importance for the successful control of insects and mite pests of tea.

In other hand, a huge amount of nutrients are being lost from the soil due to high rainfall, leaching fixation, crop removal, pruning, volatilization, evapotranspiration etc. So, the different essential nutrients in the form of inorganic fertilizer must be added to the soil in order to enrich the soil with balanced nutrients and make up the deficiencies of nutrients in the plant. Normally, plants uptake nutrients from the soil.

When fertilizers are applied to plant leaves, nutrients generally enter the plant through the cuticle which is a thin, waxy layer on the outside of leaves and stems, and through the stomata which are pores on the leaf and stem surfaces. Nutrients may enter from both the top and the undersides of the leaves. Plants can absorb a small amount of nutrients from dilute solutions sprayed on to the leaves. Since the amount of micronutrients needed by plants is very small, these can be supplied as foliar sprays, especially if nutrients are chelated for better absorption.

Plants can also absorb macronutrients through the leaves, but it is not possible to supply sufficient amounts this way; these must be taken up by the roots. Foliar application of macronutrients can help plants recover from temporary stress due to moisture problems, pests or disease. So, generally fertilizers are applied to the soil. In some special cases, fertilizers are applied as foliar. As foliar application Urea, DAP, MOP, ZnSO<sub>4</sub> and sometimes MgSO<sub>4</sub> are tried.

Single application of fertilizer is better than combined application for uniform distribution in the soil. But when labour, time and wages are in short supply, combined application of pesticide(s) together with inorganic fertilizer(s) could come as an aid or supplement to support the usual practice. However, compatibility of these chemicals and fertilizers is always to be kept in mind.

## **Compatibility of pesticides and fertilizers for foliar application**

The following principles for choosing compatibility are to be considered:

- Combined applications do not interfere with plant growth as inhibitor.
- Must not have any phytotoxic effect.
- Disintegration or stability of the chemicals and fertilizers when used in combination.
- Calculation of proper dosage of pesticides and actual quantity of fertilizers.
- The combined mixture should be used in the same day. It is not wise to carry the residual mixture overnight or future use.
- Unknown information on compatibility should be avoided straight away.
- To consult BTI regarding this compatibility aspect as and when needed.

### **COMPATIBILITY BETWEEN AND AMONG DIFFERENT PESTICIDES**

Omite + Decis	:	Not Compatible
Omite + Abom	:	<b>Compatible</b>
Omite + Karate	:	Not Compatible
Magister + Actara	:	<b>Compatible</b>
Magister + Admire	:	<b>Compatible</b>
Magister + Decis	:	Not Compatible
Magister + Karate	:	Not Compatible
Ripcord + Magister	:	<b>Compatible</b>
Ripcord + Omite	:	Not Compatible
Ripcord + Decis	:	Not Compatible
Ripcord/Decis + Dursban	:	Not Compatible
Ripcord + Karate	:	Not Compatible
Ripcord + Hexaconazole	:	<b>Compatible</b>
Decis + Sulphur	:	Not Compatible
Carbofuran + Carbosulfan	:	Not Compatible
Malathion + Bordeaux	:	Not Compatible
Malathion + Carbaryl	:	Not Compatible
Propiconazole + Carbendazim	:	<b>Compatible</b>
Copper Oxychloride + Mancozeb	:	Not Compatible
Copper Oxychloride + Abom	:	<b>Compatible</b>
Copper Oxychloride + Admire	:	<b>Compatible</b>
Copper Oxychloride + Hexaconazole	:	<b>Compatible</b>
Copper Oxychloride + Metalaxyl	:	Not Compatible
Copper Oxychloride + Sulphur	:	Not Compatible
Copper Oxychloride + Metalaxyl + Macozeb	:	Not Compatible
Copper Oxychloride + Ripcord	:	<b>Compatible</b>
Copper Oxychloride + Chlorpyrifos	:	Not Compatible
Metalaxyl + Sulphur	:	Not Compatible
Glyphosate + 2,4 D	:	<b>Compatible</b>
Any insecticide/miticide/fungicide + Hexaconazole	:	<b>Compatible</b>

## COMPATIBILITY BETWEEN AND AMONG DIFFERENT FERTILIZERS

Urea + TSP	:	<i>To be mixed just before use</i>	RP + MOP	:	<b>Compatible</b>
Urea + MOP	:	<b>Compatible</b>	RP + SSP	:	Not Compatible
Urea + SSP	:	<i>To be mixed just before use</i>	RP + DAP	:	Not Compatible
Urea + DAP	:	<i>To be mixed just before use</i>	TSP + MOP	:	<b>Compatible</b>
Urea + RP	:	<i>To be mixed just before use</i>	SSP + MOP	:	<b>Compatible</b>
Urea + SOA	:	<i>To be mixed just before use</i>	Lime + TSP	:	Not Compatible
DAP + TSP	:	<b>Compatible</b>	Lime + SSP	:	Not Compatible
DAP + SSP	:	<b>Compatible</b>	Lime + DAP	:	Not Compatible
DAP + MOP	:	<b>Compatible</b>	Lime + Urea	:	<i>To be mixed just before use</i>
DAP + RP	:	Not Compatible	Lime + SOA	:	Not Compatible
DAP + SOA	:	<i>To be mixed just before use</i>	Lime + MOP	:	Not Compatible
RP + TSP	:	Not Compatible	Lime + RP	:	<i>To be mixed just before use</i>
MOP + Zn	:	<b>Compatible</b>	Mg + Zn	:	<b>Compatible</b>
Mg + B	:	<b>Compatible</b>	Mg + Mn	:	<b>Compatible</b>
Mg + MOP	:	Not Compatible	Mg + DAP	:	<b>Compatible</b>
Mn + B	:	<b>Compatible</b>	Mn + Zn	:	<b>Compatible</b>
Urea + Zn	:	<b>Compatible</b>		:	

## COMPATIBILITY BETWEEN AND AMONG DIFFERENT PESTICIDES AND FERTILIZER(S) COMBINED

Malathion/Ripcord/Talstar + Urea	:	<b>Compatible</b>
Malathion/Ripcord/Talstar + Urea + MOP	:	Not Compatible
Ethion + Urea + MOP	:	Not Compatible
Malathion + Urea + MOP	:	Not Compatible
Ripcord + MOP	:	<b>Compatible</b>
Calypso + Urea	:	<b>Compatible</b>
Ripcord + DAP + MOP	:	Not Compatible
Ripcord + Copper Oxychloride	:	<b>Compatible</b>
Omite + Urea	:	<b>Compatible</b>
Viraat + Urea	:	<b>Compatible</b>
Copper Oxychloride + Urea	:	<b>Compatible</b>
Omite + DAP + MOP	:	<i>Better not to use combined</i>
Omite + Copper Oxychloride + Urea	:	<b>Compatible</b>
Omite + Urea + Zn	:	Not Compatible
Any insecticide/miticide + Lime + Zn	:	Not Compatible
Any insecticide/miticide + Lime + Urea + Zn	:	Not Compatible
Wettable Sulphur + DAP	:	<b>Compatible</b>
Wettable Sulphur + Ethion + Urea	:	Not Compatible
Any insecticide/miticide/fungicide + Zn	:	Not Compatible
Any insecticide/miticide/fungicide + Urea	:	<b>Compatible</b>

## **Conclusion**

Pesticides and chemical fertilizers are important input to sustain higher tea production. Pesticide combinations usually alter plant absorption and translocation as well as metabolism and toxicity at the site of action of one or more of the mixed products. Negative effects can occur such as reduced pest control, increased damage to non-target plants (phytotoxicity and incompatibility problems between materials). Besides, the target point of different insecticides and fungicides may be different though their combinations are compatible. In that case, pesticide or fungicide should be applied singly for better result and to avoid misuse of pesticides. As applying a tank mix of pesticides, or a pesticide and a liquid fertilizer, can save time, labor, energy and equipment costs, two or more pesticides, or a pesticide and a fertilizer, are compatible if no adverse effects occur as a result of mixing them together. Our experience shows that in most cases we get least problems by putting foliar fertilizer formulations first and then adding pesticide(s) to it. Now case to case sensible choice and application rests on the management. For any confusion requiring further clarity and consultation BTRI always stands by.

*Sd/-*

**(Dr. Mainuddin Ahmed)**  
Director

*Sd/-*

**(M.A. Motalib)**  
Chief Scientific Officer  
Department of Chemistry

*Sd/-*

**(Mohd. Shameem Al Mamun)**  
Senior Scientific Officer  
Entomology Division

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**Composed by:**  
Mohammad Shameem Al Mamun  
SSO, Entomology Division, BTRI

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Srimangal-3210, Moulvibazar  
Phone: +880862671225  
Fax: +880862671930  
Cell: +8801711867485  
Email: director\_btri@yahoo.com  
Web: <http://www.teaboard.gov.bd>