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FIG OLEIFICATION
Fruit Rescue Technique to Mitigate Abiotic Stress

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FOREWORD

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India is second largest fruit producing country in the world. About 6.35 million ha area is occupied by array of tropical, subtropical, temperate, arid and minor fruit crops. Owing to their hardy nature and wider adaptability, arid and minor fruits have key role in environmental and nutritional security under climate constraints situation. Fig (Ficus Carica L.) is one of the important tropical fruit crop with wider adaptability and higher 'Nutrition Index'. India produces 19,000 tons of fig from 5,000 ha area.

The predicted increase of dry days per year for many areas of the globe will further increase the problem of water shortage. Climate variabilities and recurrent droughts not only alters the fruit tree phenology but also affects yield and quality. High temperature and soil moisture stress in fig during fruiting stage is greatly influencing the economic yield. A practice of fig oleification triggers the fruit ripening and shortens the ripening duration significantly under abiotic stress. As it can be seen from the information in this bulletin, the varying components of 'Fig oleification' have been presented. I sincerely hope this technology would be immensely useful to the fig growers and horticulturist.

November, 2021
Dehradun

(M. Madhu)

CONTENTS

1.0 INTRODUCTION

The fig (Ficuscarica L.), native of Southern Arabia is one of the oldest fruits known to mankind. In India, fig cultivation is confined to Western parts of Maharashtra, Gujarat, Uttar Pradesh, Karnataka and Tamil Nadu. The climatic conditions in these places varies from hot Semi-Arid to sub- tropics. Fig are commercially cultivated in Ballari, Chitradurga and Srirangapatnam districts of Karnataka.

2.0 NUTRITIONAL IMPORTANCE OF FIG

Fresh fig fruits (Fig. 1) are very delicious, wholesome and nutritious. It can be consumed either fresh or in dried form, which contains 45-60% of sugar. Figs have higher 'Nutrition Index' than apple and raisins. The fresh fruit contain 16-19% of sugar and 3.3% of dietary fibers. They are rich source of vitamin A and C. The mineral content of fig fruit is 2.4 %; fresh as well as dry fruits are rich source of calcium, iron and copper. Fig is valued for laxative properties and is used in the treatment of skin infection.

Botanically fig fruit is multiple fruit, morphologically it is described as 'syconium', which is a vegetative, fleshy tissue with tiny true fruits enclosed inside (Fig.1) . Fresh figs generally consist of 84% pulp and 16% skin.

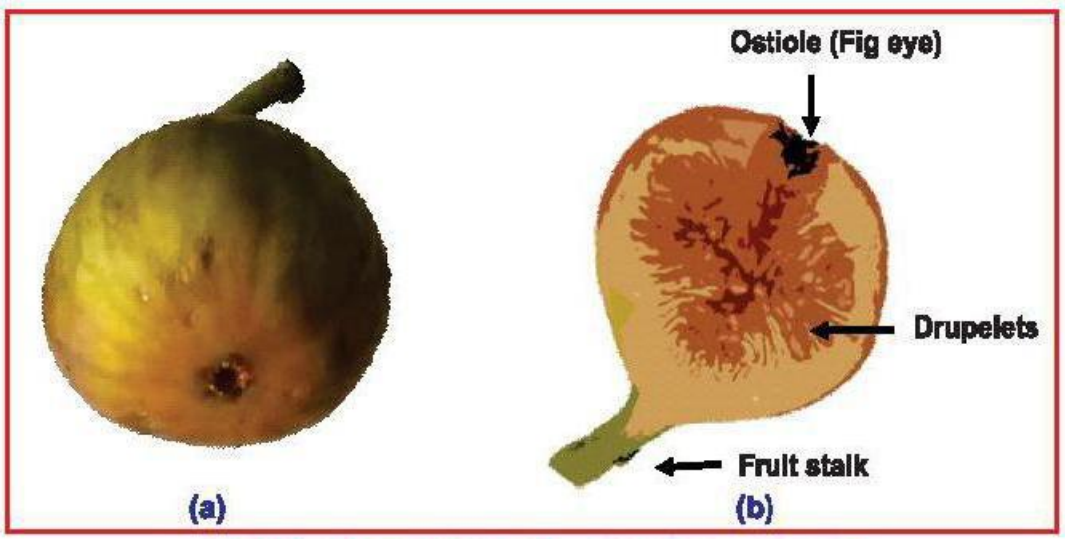

Fig.1: Fresh fig fruit (a) and parts of fig syconium (b)

3.0 WHAT IS OLEIFICATION?

The practice of applying oil to fig ostiole or eye of the intact fig for accelerated ripening (Hirai *et. al.*, 1967). In addition to accelerated ripening, oleification has been reported to eliminate staggered fruit ripening, alternative to caprification (pollination) and to avoid harvesting time which coincides to heavy rains (Langois, 1965).

4.0 NEED OF OLEIFICATION IN SEMI-ARID VERTISOLS

Fig plants are deciduous in nature and plant enters in dormancy with natural leaf-fall in summer. But, onset of the summer, high temperature and dry winds lead to early leaf senescence due to prevailing high air temperature during March and April under Ballari conditions. This period coincides with fruit maturity and ripening period. Following sunburst chart (Fig. 2) explains month-wise cumulative heat units (degree days) above base temperature 100C with different fig plant phenological stages.

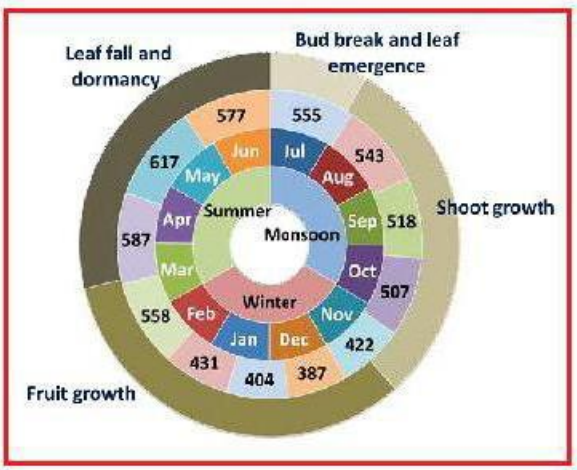

Fig.2: Month-wise cumulative heat units (°C) and fig phenological stages

This fruit growth at 'Stage III' characterized by increase in cell volume, sugar accumulation and characteristic color development. Ripening fruit acts as strong sink and matured leaves are major source of photosynthetic accumulates. Early leaf-fall in fig plants disturb the source-sink ratio. So, fruits of leafless plants remains hard-green and unripen which are unfit for consumption mainly due to lack of sugars. Vertisols undergoes severe cracking during dry period and infestation of fig rust (Cerotelium fici) in rainy season, both these conditions aggravates the leafless plant canopy.

5.0 TECHNOLOGY DETAILS

Principle

Oleification in fig triggers ripening which gives horticultural maturity with full color development and size. Oxidative disintegration of fatty acids from edible oil applied on fig eye, releases a gaseous byproducts acetone and ethylene which stimulates ripening of fruits.

Pre-requisite

Fig fruits from plants devoid of leaves or inadequate leaves can be forced to mature under stress conditions. Oleification in fig shortens the ripening process by 8 to 10 days and avoids further unfavorable climatic conditions. Fruits with open ostiole (fig eye) at the end of 'Stage II' or beginning of 'Stage III' are suitable to trigger ripening process and physiologically immature fruits should be avoided (Fig. 3 and Fig. 4).

(a) (b)

Fig. 3: Fig plant with only apical leaves (a) and plant shoot devoid of leaves (b)

Materials

- Edible vegetable oil obtained from sesame seeds or sunflower oil
- Paint hair-brush or cotton ear bud-sticks for application

Fig. 4: Representative image of sesame oil and paint brush or cotton ear-buds

Method

Dip the hair-brush or cotton ear bud-stick in oil and smear it manually on fig eye (Fig. 5). One drop of oil for one fruit is sufficient to anoint the fig ostiole.

Fig. 5: Manual application of oil on fig fruits (a), use of paint hair-brush for fig oleification (b) and fig eye anointed with oil (c)

Care to be taken

- For oleification, select fruits with open ostiole (fig eye) only.
- Applied oil should enter the wall of syconium uniformly.
- Avoid excess oil application, it may give blemishes on fruit.
- Monitor fruit ripening continuously as degree of response for ripening varies from fruit to fruit and it solely depend on physiological maturity and prevailing climate.
- Monitor the presence of ants as they are attracted by oil.
- Harvest the mature fruits immediately. 'Bent fruit stock' is ideal maturity index for ripened figs.

6.0 ADVANTAGES OF OLEIFICATION

- Oleification treatment in leaf fallen fig plants yields fruits with full color and size with desirable horticultural maturity (Fig.6).
- Fig fruit ripening period can be shortened by 8 to 10 days.
- Oleification is easy to practice and cost effective method to trigger fruit ripening in stress affected plants.
- Oleification treatment is 100% organic, eco-friendly and safe method.

Fig. 6: Ripened fig fruits after oleification treatment

- There is no 'waiting period' like other pesticides or chemicals application and fruits can be consumed readily.
- In poor source and sink relationships, fig plant retains hard-green and immature fruits without further ripening. Under these conditions, to rescue such fruits, anointing fig eye with a drop of sesame oil is a proven method to mitigate abiotic stress (Fig.7).

(a) (b)

Fig. 7: Stressed fig plant before (a) and after (b) oleification treatment

7.0 LIMITATIONS OF OLEIFICATION

- For larger plants, oleification treatment to individual fruit may be cumbersome.
- Excess application of oil gives blemishes on fruits which may be unattractive.
- Presence of oil attracts ants and association of ants with mealy bugs may risk their incidence.
- Smaller and uneven fruit size than naturally ripened fruits.

8.0 SCOPE OF APPLICATION

The oleification treatment in fig can be adopted in all fig growing areas of tropics especially where single crop is harvested in spring-summer followed by pruning. All Indian fig cultivars (Poona, Ballari, Dianna, Dinkar, Daulatabad *etc.*) are 'Common type' fig cultivars which develops fruits parthenocarpically (without pollination/fertilization) so oleification is equally suitable for all cultivars to mitigate abiotic stress.

9.0 COST OF FIG OLEIFICATION

- To achieve oleification in 100 fig fruits about 40 to 50 ml of sesame oil is required which costs around Rs. 10 to12/-
- Efficient speed of fig oleification is 100 fruits per hour.
- Almost all fruits reaches maturity after oleification hence benefits achieved by avoiding immature, non-edible fruits are higher.

Growth Stages of Fig Plant

1. Bud break

2. Leaf emergence

3. Shoot growth

4. Fruiting stage II

5. Fruiting stage III

6. Leaf fall and dormancy

Cross sectional and longitudinal view of Fig

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