

Review Article

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## Response of Triacantanol on Temperate Fruit Crops - A Review

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### ABSTRACT

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Triacantanol is a natural plant growth regulator for fruit plants. Triacantanol is used to enhance the growth, chlorophyll content, photosynthesis, transpiration, stomatal conductance and uptake of nutrient in different fruit crops. Triacantanol increases the amino acids, sugars and carbohydrates in plants. It also influences other metabolic processes in different fruit crops.

### Introduction

Triacantanoll (TRIA), is a natural plant growth regulator found in plant cuticular waxes and bee wax. It is a straight chain 30 carbon alcohol i.e. primary alcohol is an endogenous hormone which is active at very low concentration on the cell membranes and acts in combination with other long chain alcohols to regulate the formation of TRIM, a secondary messenger(s) of TRIA.

TRIM, the putative secondary messenger elicited by TRIA, move rapidly throughout the plant resulting in dry matter increase (Ries and Wert, 1988). Triacantanol is reported to improve growth, photosynthesis, transpiration, stomatal conductance and

uptake of water and nutrients and other metabolic activities in different crops (Krishnan and Kumari, 2008).

Application of triacantanol applied either to the leaves or to root medium influence different physiological activities in different fruit crops. They also improve plant performance under adverse conditions.

Therefore the use of triacantanol is increasing day by day in different fruit crops to influence different plant responses. Presently its use is also picking up in temperate fruit crops. Therefore the present review covers the response of traicantanol on plant growth, water relations and leaf nutrient status in different temperate fruit crops.

### **Effect on plant growth and vigour**

Markedly higher annual shoot growth was observed in Santa Rosa plum with the 10 ppm triacontanol (Barua, 1990) and in Red Delicious apple with 0.75 ml l<sup>-1</sup> Miraculan (Sharma, 1990). Growth and size of Japanese plum were increased when sprayed with triacontanol (Chandel, 1985). Improved growth with triacontanol has also been observed in New Castle apricot (Mahajan *et al.*, 1988). Red Delicious apples treated with 0.6 ml l<sup>-1</sup> Paras Photosynth (Sharma, 1990) had the maximum leaf area. Similarly, leaf growth and petiole length in Golden Delicious apples increased on treatment with Agrispon (triacontanol) twice, 3 weeks after flowering and 10-15 days later (Dubravec *et al.*, 1995). Size and dry weight of apricot leaves increased with the application of Miraculan and Vipul (Mahajan *et al.*, 1988). Similarly, Barua (1990) recorded higher leaf area in Santa Rosa plum on treatment with 5 ppm triacontanol.

Sharma and Joolka (2002) reported more annual extension growth, plant height and spread in Non Pareil almond treated with 10 ppm triacontanol in comparison to other treatments. Joolka and Sharma (2003) observed better shoot growth in apricot cv. New Castle with 5 ppm triacontanol applied once at 15 days before flowering and repeated at pit hardening stage. Tomar and Singh (2007) reported maximum tree height, trunk girth, shoot growth and tree volume with triacontanol in walnut cv. Local Selection.

Sharma *et al.*, (2008 a) applied triacontanol at 2.5, 5.0, 7.5 and 10.0 ppm thrice, viz., 7 days before full bloom, 15 days after full bloom and one month after second application in apple cv. Red Delicious and observed that application of 7.5ppm triacontanol increased shoot extension growth in comparison to other triacontanol treatments. Sharma *et al.*,

(2008 b) and Wangmo *et al.*, (2008) observed that application of triacontanol was most effective in promoting tree growth in Santa Rosa plum.

### **Effect on root growth**

Tantos *et al.*, (2001) argued that the provision of triacontanol could increase the number of roots per plant.

### **Effect on chlorophyll content**

Leaf chlorophyll content increased in Santa Rosa plum after treatment with 2.5 ppm triacontanol (Barua, 1990), in Red Delicious apple with 0.6 ml l<sup>-1</sup> Paras Photosynth (Sharma, 1990) and in Elstar and Golden Delicious apples with Agrispan (triacontanol) (Dubravec *et al.*, 1995). Sharma and Joolka, (2000) also reported increased leaf chlorophyll content in Non Pareil almond with 10 ppm triacontanol.

### **Effect on photosynthesis, transpiration and stomatal conductance**

Exogenous application of triacontanol regulates several physiological and biochemical processes directly or indirectly (Ries and Houtz, 1983). Photosynthetic rate increased in Santa Rosa plum after treatment with 2.5 ppm triacontanol (Barua, 1990), in Red Delicious apple with 0.6 ml l<sup>-1</sup> Paras Photosynth (Sharma, 1990) and in Elstar and Golden Delicious apples with Agrispon (triacontanol) (Dubravec *et al.*, 1995). Sharma and Joolka (2000) also reported increased rate of photosynthesis, transpiration and stomatal conductance in Non Pareil almond with 10 ppm triacontanol. Rate of photosynthesis and transpiration was significantly affected by application of bioregulators and highest photosynthetic and transpiration rate was observed with the application of triacontanol 7.5ppm in apricot (Thakur, 2014).

### **Effect on carbohydrate content**

Shoots of Santa Rosa plum had highest carbohydrate content when treated with 5 ppm triacontanol (Barua, 1990). Sharma (1990) recorded highest total sugars, starch and carbohydrate contents in Red Delicious apple leaves with 0.75 ml l<sup>-1</sup> Miraculan. Sharma *et al.*, (2002) reported higher accumulation of leaf carbohydrates content in Non Pareil almond with 10 ppm triacontanol.

### **Effect on micropropagation**

The effectiveness of triacontanol woody plants have also been successfully investigated although in micropropagation i.e. via organo-genesis in plants of apples (*Malus domestica* cv. JTE-E4) and cherry (*Cerasusfruticosa* cv. Probocskai) (Tantos *et al.*, 2001).

### **Effect on nutrient uptake**

Triacontanol has been known to influence the nutrient levels in various fruit crops. Therefore, effect of triacontanol on the uptake of macro nutrients is reviewed under the following heads:

#### **Nitrogen**

N content increased in the leaves of Santa Rosa plum with 7.5 ppm triacontanol (Barua, 1990), in Red Delicious apple with 0.75 ml l<sup>-1</sup> Miraculan (Sharma and Joolka, 1994) and in Non Pareil almond with 10 ppm triacontanol (Sharma and Joolka, 2011).

#### **Phosphorus**

Foliar sprays of 2.5 ppm triacontanol or 10 ppm Miraculan resulted in highest leaf P content in Santa Rosa plum (Barua, 1990). Sharma and Joolka (1994) observed that Miraculan at 0.75 ml l<sup>-1</sup> was most effective in

raising the foliar P content in Red Delicious apple. Sharma and Joolka (2011) also reported increased leaf P content in Non Pareil almond with 10 ppm triacontanol.

#### **Potassium**

Leaf K content was higher when Santa Rosa plum trees were sprayed with 2.5 ppm triacontanol (Barua, 1990). Similarly, Sharma and Joolka (1994) observed that Miraculan at 0.75 ml l<sup>-1</sup> was most potent in raising foliar K content of Red Delicious apples. Sharma and Joolka (2011) also reported increased leaf K content in Non Pareil almond with 10 ppm triacontanol.

#### **Calcium**

Sharma and Joolka (1994) observed that among different chemicals studied, Miraculan at 0.75 ml l<sup>-1</sup> was most effective in raising the foliar Ca content in Red Delicious apples. Sharma and Joolka (2011) also reported increased leaf Ca content in Non Pareil almond with 10 ppm triacontanol.

#### **Magnesium**

Miraculan at 0.75 ml l<sup>-1</sup> markedly raised the foliar Mg content in Red Delicious apples (Sharma and Joolka, 1994). Sharma and Joolka (2011) also reported increased leaf Mg content Non Pareil almond with 10 ppm triacontanol.

From the above review it can be concluded that triacontanol improves the growth and other physiological activities as well as leaf nutrient status in different temperate fruit crops. Foliar and soil application of triacontanol is very effective in improving plant response to various factors. However, further studies are required to reveal the possible role of triacontanol on the regulation of plant growth and other metabolic activities

in different temperate fruit crops for its wider application.

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