



NATCA a Potential Bio-Regulator for Fruit Production: A Review

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ABSTRACT

N-acetyl thiazolidine 4-carboxylic acid is a new generation plant bio regulator which has been used in agriculture for substantial use. It is a mixture of organic amino acids which used as activator in horticultural crops, industrial crops, and tropical crops and fruit trees. It improves the metabolic activities of the crops and provides fastest recovery of the treated crops. It is also used as a fruit setter; bio stimulant germination enhancer, augmenting the vegetative growth, leaf chlorophyll formation and help in increasing yield potential of plant. It triggers plants to synthesize amino acids and hormones that are essential for normal functioning, growth and development of plants. In this paper we will study details about its mode of action, mechanism and response in fruit crops.

Key Words: ATCA, Bio-Stimulant, Foliar application, CPPU

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INTRODUCTION

Elanta Super is an organic growth promoter which contains N-acetyl thiazolidine 4-carboxylic acid (NATCA), 10% Folic acid with 0.2% adjuvant, used for plant growth for increasing in both fruit production & fruit qualities. This agrochemical is recently introduced by Coromandel Fertilizers, Secunderabad, India for attaining higher values of yield and quality attributes in agricultural and horticultural crops. It is a stabilizer buffer, when applied to plants helps to tolerate certain types of stresses more effectively and enhance crop yield [1]. It is applied as foliar spray absorbed by the leaves to stimulate photosynthesis and leaf growth [2 & 3].

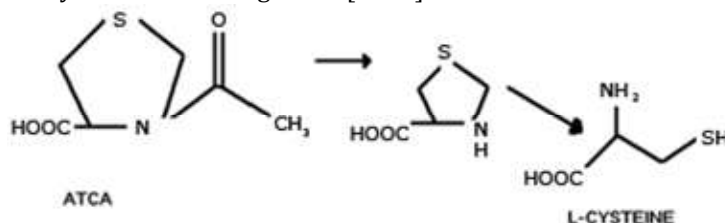


Fig1: Molecular structure of ATCA converting to L-cysteine

Many toxicological studies are taken to evaluate the toxicity and the potential negative effects of the ATCA on man, animals and environment. ATCA did not envisaged any negative effect in every of these toxicological study. Applications of ATCA do not lead to any danger on growth, composition and circulation of blood, liver and reproductive system. Till now there is no evidence of any teratogenic or mutagenic effects due to ATCA application.

NATCA at a glance can promotes uptake of major and micro nutrients, enzymatic activity, stimulates photosynthesis, stimulates protein creation as it contains amino acid - Bulbing block of proteins, induces synthesis of hormones like I.A.A and gibberellins, which helps in flowering and fruit setting, helps to fight

biotic and abiotic (draught) resistance, increases valine and glutamine content – thereby increasing plant resistance to water and temperature stress

MODE OF ACTION

The favourable effects of the ATCA compound on plant are linked to the well-known role of L – Cysteine and L – Proline in the biochemical processes at the cell level. L – Cysteine cannot be directly utilised by the plant when supplied by an external source. Penetration through root and leaves is often difficult and, whenever such compounds are absorbed, they undergo improper translocation or metabolic degradation that hinder their significant direct introduction into the normal nutritional pathways. ATCA, on the contrary, has its active sites adequately protected, so that it can cross the metabolic barriers satisfactorily and slowly release the original amino acids into the cells as a result of enzymatic transformation. L – Cysteine has an important role in many biochemical processes in the plant due to its thiol (-SH) group. ATCA slowly gets converted to Thioproline (TCA), Formyl Cysteine and finally to L – Cysteine through a chain of biochemical reactions, as given in Fig 2.

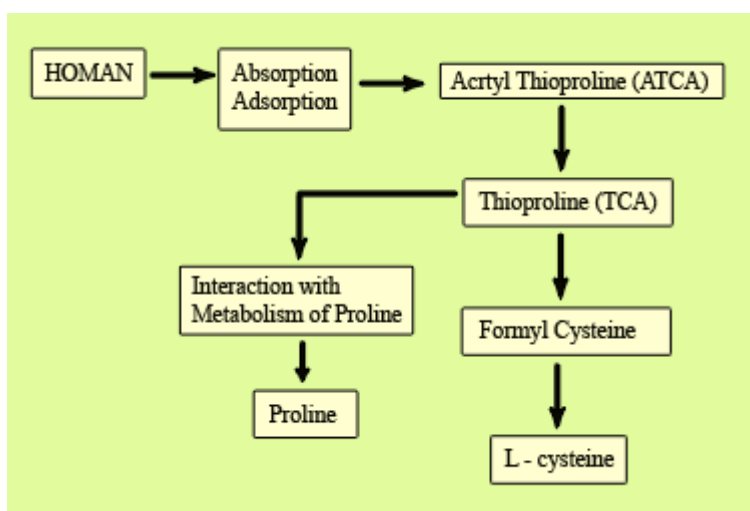


Fig 2: Transformation of ATCA compound into proline and L-cysteine

EFFECT OF NATCA ON VEGETATIVE GROWTH

The application of Agrispon (NATCA) 1ml/liter at three weeks after flowering, and again 10 to 15 days after the first treatment significantly stimulated the growth and development of leaves [petiole length (2.7), and leaf width (5.52) and length (9.98)] for the cv. Golden Delicious, but Ergostim 1ml/liter at three weeks after flowering, and again 10 to 15 days after the first treatment affected only leaf length (8.7) as compare to control [4].

Ramteke and Somkumar observed that application of Quantum (N-acetyl thiazolidine-4-carboxylic acid) at 0.10% with 2 foliar sprays+2 cluster dipping increased the mean shoot length, but not leaf size, leaf chlorophyll content and specific leaf weight (SLW) in grape cv. Tas-A-Ganesh grafted on 1613 C rootstock [5].

Ramteke and Khotereported that application of 1 ml Elanta Super along with 15 ppm GA₃ and 1 ppm CPPU at 45, 75 and 90 days after pruning increased the Leaf area (223.1 cm²) and total chlorophyll (2.06 mg/g) in Sonaka grapes [6].

Hota *et al.*, conducted an experiment by applying different combination of CPPU and NATCA at different time on apricot cv. New Castle. He observed that application of NATCA alone or with combination with CPPU increased the annual shoot growth, tree height, tree spread, tree volume, trunk girth, leaf area and leaf chlorophyll content [7&8].

Effect of amino acids on fruit size

Ramteke and Somkumar observed that treatments of quantum (N-acetyl thiazolidine-4-carboxylic acid) at 0.1% at 45 and 75 day after pruning along with 2 cluster dipping at 102 and 112 days after pruning increased the mean bunch weight, 50 berry weight, pedicel thickness berry length in grape cv. Tas-A-Ganesh grafted on 1613 C rootstock [5].

Hota *et al.* conducted an experiment by applying different combination of CPPU and NATCA at different time on apricot cv. New Castle. He observed that application of NATCA alone or with combination with

CPPU increased Fruit length, fruit diameter, fruit weight and fruit volume, pulp weight, stone weight and pulp to stone ratio [9 & 10].

Effect of amino acid on yield

Himelrick reported that an increase in the yield in strawberry was observed by a bioregulator which are similar active ingredient as Elanta super [11].

Ramteke and Somkumar observed that treatments of quantum (N-acetyl thiazolidine-4-carboxylic acid) at 0.1% at 45 and 75 days after pruning along with 2 cluster dipping at 102 and 112 days after pruning increased the yield per vine in grape cv. Tas-A-Ganesh grafted on 1613 C rootstock [5].

Srivastava *et al.* reported that foliar spray of Fantac (NATCA) at the rate of 25, 50 and 75 ml/100 litre water at tillering stage increased the number of grains/panicle by 4.8, 6.2 and 6.6 percent over control, respectively but Fantac at the rate of 50 and 100 ml/100 litre water decreased the number of chaffy grains/ panicle significantly by 8.1 and 13.6 percent over control, respectively in rice cv. Pant Dhan-4 [12].

Ramteke *et al.* reported higher yield per plant (32.22%) by treatment of 1.5ml of Fantac(NATCA) per liter of water followed by 1ml of Fantac per liter of water(21.57%) in Thompson seedless grape during the fruiting year 2006-2007 [13].

Ramteke and Khot recorded maximum yield (16.52 kg/vine) was found with application of 1 ml Elanta Super (NATCA) along with 15 ppm GA₃ and 1 ppm CPPU at 45, 75 and 90 DAP (days after pruning)as compared to control in Sonaka grape [6].

Hota *et al.*, conducted an experiment by applying different combination of CPPU and NATCA at different time on apricot cv. New Castle. He observed that application of NATCA alone or with combination with CPPU increased Fruit set, fruit retention and decrease the fruit drop percentage ultimately increased the yield [7, 9 & 14].

Effect of amino acids on fruit quality

Ramteke and Somkumar observed that treatments of quantum (N-acetyl thiazolidine-4-carboxylic acid) at 0.1% at 45 and 75 days, along with 2 cluster dipping at 102 and 112 days after pruning increased the berry crispness, but reduced the anthocyanin content in grape cv. Tas-A-Ganesh grafted on 1613 C rootstock [5].

Ramteke *et al.* reported higher total soluble solid (21.2 °Brix) with the application of FANTAC(NATCA) 2 ml per liter at 5 leaf stage, pre-bloom stage, 75% cap fall stage, 20days before harvest and lowest total soluble solid (20.0°Brix) with 0.5 ml FANTAC per liter of water in Thompson Seedless grape [13].

Ramteke and Khot recorded highest total soluble solids content with application of 0.5 ml Elanta Super + 15 ppm GA₃ (21.00) at 45, 75 and 90 DAP (days after pruning) in grapevines. Elanta Super might have helped in synthesis of sugar and metabolism of organic acid and also to have higher total soluble solids in berries. The increase in the level of fruit TSS and sugar contents in NATCA treated trees can be attributed to channelization of assimilates translocation to the developing fruits as a consequence of slower shoot growth [6].

Hota *et al.*, [15] and Hota *et al.*[16] conducted an experiment by applying different combination of CPPU and NATCA at different time on apricot cv. New Castle. He observed that application of NATCA alone or with combination with CPPU increased fruit firmness, TSS and TSS: Acid ratio, Total Sugars.

Blunden *et al.* [17] reported that the growth promoting effect of aqueous extracts of seaweeds (Amino acids and Manitol) was largely due to the metal cations present, but the effects were modified by organic substances in the extracts. It may be inferred that the metal cations present in the amino acids may act as a source for the fruits to increase its total soluble solids and total sugars content of fruits. The reduction in water content of fruit and conversion of cell wall components such as starch, protein, pectin and hemicelluloses into simple soluble sugars during storage is responsible for increasing TSS content [18].

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