

Ascorbic acid, β -Carotene and Amino acids in Capsicum (*Capsicum annuum*) during fruit development in Himalayan Hills

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Abstract. Capsicum varieties viz HC-201 & HC-202 developed at ARU, Almora took 35 days from fruit set to ripening. Results showed significant positive correlation for ascorbic acid and β -carotene with days to maturity. Out of eight ninhydrin positive products, only seven could be identified viz, hydroxyproline, proline, lysine, ϵ -alanine, arginine, threonine and methionine, at the later stages of the fruit development. All amino acids except methionine were found either absent or in traces at the earlier stages of fruit development.

1. Introduction

Capsicum belongs to one of the group of the chilli used as vegetable. They are bell shaped, non-pungent and mild thick-fleshed. Biochemical changes associated with maturity play an important role during the fruit development. Systematic growth studies coupled with changes in chemical constituents vary with variety, soil and environmental conditions¹⁻⁵. No such information is available regarding biochemical constituents on HC-201 & HC-202 Capsicum varieties. Therefore, it was considered important to study the changes of vitamins and aminoacids during fruit development.

2. Material & Methods

Two high yielding varieties of capsicum, namely HC-201 & HC-202 developed at ARU, Almora were grown in the experimental fields in randomised block design. Three replications were taken for each variety during the year 1979-80 using standard agronomical practices⁶⁻⁷. Composite samples were made at different intervals (10, 15, 20, 25 and 35 days after fruit set) and were analysed for ascorbic acid, β -carotene

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and free amino acids. Ascorbic acid and free amino acids were analysed by the methods reported earlier⁸. β -carotene was estimated by standard method⁹.

3. Results & Discussions

A perusal of data (Table 1 & 2) would reveal that ascorbic acid and β -carotene increased progressively with fruit development. Statistical analysis showed a significant correlation with ascorbic acid and β -carotene with fruit development. Increase of ascorbic acid may be attributed to its regular synthesis from hexeses during maturation¹⁰. Regression equation showed 2.6489 and 3.2641 (mg/100 g fresh wt) per day increase of ascorbic acid content during the fruit development in respective varieties.

Table 1. Changes in β -carotene and ascorbic acid during fruit development

| Days after fruit set | Variety* | β -carotene (mg/100g) | Ascorbic acid (mg/100g) |
|----------------------|----------|-----------------------------|-------------------------|
| 10 | A | 1.02 | 44.00 |
| | B | 1.09 | 40.25 |
| 15 | A | 1.23 | 60.90 |
| | B | 1.27 | 56.80 |
| 20 | A | 1.60 | 72.20 |
| | B | 1.71 | 75.75 |
| 25 | A | 1.83 | 103.30 |
| | B | 1.78 | 109.00 |
| 35 | A | 2.35 | 106.35 |
| | B | 2.40 | 116.50 |

* A - HC-201

B - HC-202

Table 2. Statistical interpretation of β -carotene and ascorbic acid during fruit development

| Bio-chemical constituents | | Regression equation | Correlation coefficient |
|---------------------------|---|--------------------------|-------------------------|
| Ascorbic acid | A | $Y = 21.7027 + 2.6489 x$ | 0.9432* |
| | B | $Y = 11.1149 + 3.2641 x$ | 0.9565* |
| β -carotene | A | $Y = 0.4697 + 0.0541 x$ | 0.9976** |
| | B | $Y = 0.5489 + 0.0524 x$ | 0.9885** |

* Significant

** Highly significant

A & B are HC-201 & HC-202 varieties respectively.

Table 3. Relative Concentrations of amino acids at different stages of the fruit development of Capsicum

| Day after | Variety* | Lysine | Arginine | Hydroxy-proline | Threonine | L-alanine | Methionine | Proline |
|-----------|----------|--------|----------|-----------------|-----------|-----------|------------|---------|
| 10 | A | - | - | - | - | - | + | - |
| | B | - | - | - | - | - | + | - |
| 15 | A | - | + | + | + | - | ++ | +++ |
| | B | - | + | + | + | - | ++ | +++ |
| 20 | A | + | +++ | ++++ | ++ | +++ | +++ | +++ |
| | B | + | +++ | ++++ | ++ | +++ | +++ | +++ |
| 25 | A | +++ | ++ | +++ | ++++ | + | ++++ | ++ |
| | B | +++ | ++ | +++ | ++++ | + | ++++ | ++ |
| 35 | A | ++ | ++++ | +++ | +++ | ++ | ++++ | + |
| | B | ++ | ++++ | ++ | +++ | ++ | ++++ | - |

+, ++, +++, +++ and ++++ are relative concentrations of the amino acids.

- absent or in traces.

* A - HC-201

B - HC-202

β -carotene also showed a positive significant correlation with fruit development. Regression coefficient calculated revealed the increase of 0.0541 and 0.0524 (mg/100g fresh wt) per day during fruit development. Increasing trend of β -carotene may be due to its synthesis during the development¹¹⁻¹².

Out of eight ninhydrin products, seven amino acids namely hydroxyproline, proline, lysine, arginine, ϵ -alanine, threonine and methionine were identified at the later stages of the fruit development. All amino acids except methionine were found either absent or in traces at the early stages of the fruit development. Concentrations of the different amino acids at different stages of the fruit development are presented in Table 3. Statistical analysis revealed that only arginine showed a significant positive correlation with fruit development. Regression coefficient revealed an increase of 4.1391 and 4.1092 (mg/100 g fresh wt) per day in respective varieties.

From the studies it was concluded that Capsicum is a good source of vitamins and few of essential amino acids provided that it is harvested at 25-35 days after fruit set.

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