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NOTES

Amino Acid Metabolism with Fruit Development in *Lycopersicon esculentum* Mill under Kumaun Hill Conditions

K.N. MATHPAL* and P.C. PANT†
Department of Chemistry
Kumaun University Campus, Almora-263 601, India

Mature variety of HS-102 and HT-6 of tomato (*Lycopersicon esculentum* Mill) showed the presence of eleven ninhydrin positive products. Out of these, eight products were identified as aspartic acid, ornithine, arginine, threonine, α-alanine, methionine, valine and isoleucine through various specific chemical reactions and spectral studies.

Tomato is one of the most important 'protective foods' both because of its special nutritive value and its large wide spread production. Nutritive value of the fruit varies with variety, environment, maturity and morphological characters of the fruit[1–6]. In our earlier communications we have studied the changes in the bio-chemical constitutents of tomato[7] and bean[8, 9] at different stages of fruit development under hilly conditions. Scanty information[10, 11] is available regarding free amino acids of tomato. Therefore, it was thought of utmost importance to know the pattern of change of free amino acids with fruit development in two varieties of tomato *viz.* HS-102 and HT-6 under Kumaun Hill conditions.

Two varieties of tomato *viz.* HS-102 and HT-6 were grown in A.R.U. Field in Almora and samples were taken at the five stages of pod development (*i.e.*, 8 to 24 days of fruit set). Samples were taken at random and composite samples were prepared for each stage of fruit development.

Determination of free amino acids was made on an extract of fruit prepared with 95% ethanol. For the determination of free amino acids, the ethanolic extract was passed through a column of Dowx 50W-X8 (H form), 200–400 mesh and eluted with 2N NH_4OH. Amino acids were tentatively identified by paper chromatography.

Out of eleven ninhydrin positive products only eight amino acids namely aspartic acid, ornithine, arginine, threonine, α-alanine, methionine, valine and isoleucine were identified at all stages of the fruit development in both the varieties (Table 1). These were found to be present in varying concentration at different stages of the fruit development. Concentrations of aspartic acid,

†Defence Agricultural Research Unit, Himalayan Research Complex, Almora-263 601, India.

TABLE 1
CHANGES IN FREE AMINO ACIDS WITH FRUIT DEVELOPMENT IN TOMATO (*LYCOPERSICON ESCULENTUM* MILL) mg/100 g. FRESH WEIGHT

Maturity Stage	Days after fruit set	Variety	Aspartic acid	Ornithine	Arginine	Threonine	L-Alanine	Metheonine	Valine	Isoleucine
I	6	HS-102	9.76	14.32	17.88	9.76	15.62	4.68	15.30	9.71
II	12	HS-102	16.52	24.78	10.68	11.66	12.73	3.73	18.41	12.24
III	16	HS-102	35.21	20.43	8.34	12.40	8.43	3.12	28.20	13.78
IV	20	HS-102	24.42	18.43	7.43	9.43	5.84	2.80	24.28	14.28
V	24	HS-102	16.50	17.46	7.40	6.43	3.40	2.40	18.46	18.27
I	8	HT-6	9.74	13.57	14.73	8.41	14.74	4.73	14.34	10.73
II	12	HT-6	13.43	19.45	11.54	10.41	11.84	3.14	16.73	12.74
III	16	HT-6	27.32	17.56	9.32	13.47	9.32	2.89	24.14	13.93
IV	20	HT-6	18.40	14.34	8.43	9.41	5.83	2.43	22.17	14.74
V	24	HT-6	14.56	14.14	8.12	7.41	4.12	2.12	17.30	20.73

ornithine, valine and isoleucine were found to increase while arginine, threonine, α-alanine and methionine were found to decrease with the fruit development. However, the observed trend of increase and decrease was found erratic. Highest concentration of aspartic acid (20.48, 16.69 mg/100g fresh wt) were recorded in HS-102 and HT-6 varieties respectively. Variation in the concentration of amino acids with the varieties of tomato may be attributed to the difference in the genotypes.

Statistical results showed a significant negative correlation for arginine, α-alanine and methionine while a significant positive correlation was found for isoleucine with days to maturity. Regression coefficient calculated showed 0.5733% and 0.3787%; 0.7078% and 0.6153% and 0.1264% and 0.1386% per day decrease for arginine, α-alanine and methionine respectively. However, 0.4334% and 0.4902% per day increase for isoleucine was found in HS-102 and HT-6 varieties respectively.

Observed trend of increase in the concentration of aspartic acid, valine, ornithine and isoleucine could be attributed to the results of lessened demand for these metabolites as growth process is slowly taken over by ripening process in the later stage of maturity. The role of aspartic acid may be correlated with Krebs cycle intermediate 'port of energy' for nitrogen. For other amino acids the concentration of those decreased with maturity, it may be assumed that synthesis of various amino acids takes place in the fruit at a rapid rate during the early stages of development and when the fruit ripens they get incorporated into various proteins so that the concentration of amino acids becomes less and by the time of maturity the amount of free amino acids is appreciably reduced. Erratic behaviour of most of the amino acids indicates their involvement in several intermediate metabolic processes during fruit development and it can also be attributed to soil and environmental condition (Appendies I and II), degradation, interconversion of amino acids, transportation of free amino acids from leaves to fruits and vice-versa. Genetically determined differences and physiological ageing of the organ in question may play a decisive role in the metabolism of these compounds.

APPENDIX I

ENVIRONMENTAL CONDITIONS DURING EXPERIMENT
(June-July)

Average temperature °C			Average relative humidity		Average soil temperature °C			Wind velocity km/hr. (average)
Max Temp.	Minimum Temp.	Mean	0900 hrs.	1430 hrs.	5 cm	10 cm	15 cm	
32.63	18.04	25.34	81	69	27.32	27.19	27.06	1.48

APPENDIX II

Soil Conditions

Sandy loam colour 10 yR 5/3 (brown), crumb, loose friable, non-sticky, non-

plastic, moderate permeability, well drained. Soil is high medium in nitrogen, low in phosphorus and high in potassium.

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