INTERNATIONAL JOURNAL OF RESEARCHES IN BIOSCIENCES, AGRICULTURE & TECHNOLOGY
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www.vmsindia.org

Biochemical Analysis Of Nmu Induced Dysynaptic Mutant Of *Physalis Ixocarpa* Brot

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ABSTRACT

Physalis ixocarpa Brot. commonly called as Mexican husk tomato is widely grown as a minor crop and extensively used in western countries as it responds positively to any type of soil and climate. The fruits are used for the preparation of curries, jams, sauces and jellies and the taste is similar to tomato. This species attracts considerable attention because of its economic as well as medicinal properties. Information relating to the biochemical work on species of *Physalis* is meagre. In view of this, quantitative amino acid analysis was done for 0.2% of NMU (Nitro so N-methyl Urinate) induced desynaptic mutant along with control for comparison. Probable reasons for desynapsis during meiosis at biochemical level was discussed in the present paper.

Keywords: Desynaptics, Free Amino acid, Mutant, NMU, *Physalis*, Protein Amino acid.

INTRODUCTION

Physalis ixocarpa Brot. Commonly called as Mexican husk tomato is a native of Mexico belongs to family Solanaceae .This plant is widely planted as a minor crop and extremely used in western countries as it responds positively to any type of soil and climate. The fruits are used for the preparation of sauce, jams and jellies and the taste is similar to tomato. A steroid Physalin extracted from leaves and roots has prophylactic and therapeutic properties for treating infections, auto immune diseases and it also acts as anti leukemic agent. It attracts considerable attention because of its economic as well as medicinal properties.

In view of the drastic decrease in the pollen fertility in one of the plants of the M2 population the flower buds were cytologically screened. Most of the meiotic cells exhibited univalents, isolated as a desynaptic plant. Interestingly this plant was morphologically and cytologically different from its control. On the other hand amino acids are important components of many biochemical substances produced during the course of sexual differenciation (Kaul,1987) and is generally correlated with fertility (Duvick,1965). In view of this the flowers of mutant along with control was used for the isolation of amino acids.

MATERIAL AND METHODS

The fresh flowers of 0.2% NMU induced desynaptic mutant isolated from M_2 generation and control plant of the same age were collected for the study of amino acid analysis. 200mg of the fresh flowers of the mutant as well as control were macerated in 10 ml of 80% ethanol. Then the slurry was centrifuged 9200rpm) and the supernatant taken in a test tube was reduced to dryness under vacuum at a temperature not exceeding 40°C. The residue was dissolved in 2 ml of sample buffer (citrate buffer, pH 2.2) and 0.5 ml of the sample was injected into LKB 4101 Automatic Amino acid Analyser for the estimation of free and protein amino acids following the method of Moore and Stein (1948).

RESULT

Morphologically the desynaptic plant of the present study exhibits relatively weak and stunted growth, small leaves and flowers and also late flowering. In view of significant reduction in its pollen fertility and drastic alterations in chromosomal pairing, the flower of the control and mutant were studied for free and protein amino acids by Amino Acid Analyser.

In addition to the amino acids present in the standard amino gram some peaks were present in the mutant and the control representing unknown amino acids.

Free amino acids: Free amino acids and their quantities in the fresh flowers of the mutants and the control were compared and presented a different pattern, as can be expected from the fact that they were mutants affecting different plant characters.

In this mutant valine was present in some quantity while being absent in the control; on the other hand proline, glycine, alanine and serine were present in some quantities in the control but absent in the mutant.

Protein amino acids: Comparison of protein amino acids of the flower of the desynaptic with the control reveals major differences in at least seven amino acids; the mutant was poor in proline and valanine and lacks glycine; it was richer in glutamic acids, threonine, phenyalanine and lysine by two to sixteen folds. In the total quantity of the amino acids there was fifty per cent reduction in the mutant compared to the total in the control.

Table:
Free and protein amino acid composition (micromoles/gram) of fresh flowers of control and mutant of *Physalis ixocarpa* Brot.

Aminoacid	Control		Mutant	
	Free amino acid	Protein amino acid	Free amino acid	Protein amino acid
Aspartic acid	1.95	8.3		
Throenine	*	4.3	0.24	67.5
Serine	1.26	*	*	11.6
Glutamic acid	*	8.0	1.43	56.6
Proline	0.60	606.6	*	226.6
Glysine	0.70	45.30	*	*
Alanine	1.00	*	1.10	4.20
Cystine	*	103.0	*	108.00
Valine	*	72.7	2.80	22.90
Methionine	0.01	7.8	0.40	18.60
Isoleucine	0.20	29.2	0.12	13.60
Leucine	0.14	21.00	1.15	19.00
Tyrosine	0.025	28.4	*	7.10
Phenylalanine	0.22	25.7	1.20	51.5
Histadine	0.15	18.3	0.31	8.50
Lysine	0.006	13.8	0.20	48.00
Arginine	*	*	*	*
Total	6.26	992.40	8.96	663.70

*Those amino acids not represented in the table, might be present in undetectable quantities within the sensitivity of the instrument and such amino acids were considered as absent.

DISCUSSION

Amino acids, the initial products of nitrogen assimilation are building blocks of proteins. Characteristic differences in some bound and free amino acid fractions have been detected between the flowers of the three accessions. Such differences in the amino acid patterns of the free and bound fractions were also reported in the species and species hybrids of *Gossypium* , Sarvella and Stojanovic, 1968.

In the present investigation the observed deficiency or increase in the quantity of all free amino acids in this mutant may be explained due to a partial or complete block of synthesis of one or more specific proteins. Patterson et al (1986) recorded an increase in the total quantity of free amino acids in the male sterile of *Gossypium* over their non-segregating male fertile and they attributed this phenomenon to a partial block of protein synthesis. In the present investigation also free amino acids were more accumulated in the mutant, which may leads to pollen sterility.

Among the amino acids, proline is an important source of nitrogen in plant metabolism (Britikov et al., 1970). Besides, it is an important component of many biochemical substances produced during the course of sexual differentiation (Kaul, 1997) and is generally correlated with fertility of seed or pollen (Duvick, 1965). On the other hand glutamic acid is considered to be a precursor of proline in plants (Coleman and Hagerly, 1957 Vogel and Bonner, 1954).The lack of proline in plants is due to the retardation in the conversion of glutamic acid to proline (Fukasawa, 1962).

Some of the amino acids already mentioned above regulate the growth and development of plant parts as well as the pollen or seed fertility.

In the present investigation also some of the amino acids proline ,glutamic acid and glycine are deficient in mutant. Thus an overall reduction in quantity of above said amino acids may be are of the factors responsible for reduced pollen fertility and seed set

It is generally known that accumulation of free amino acid followed by deficiencies in the protein fraction causes sterility. In the present study also total accumulation of free amino acids followed by deficiency of the protein fraction causes pollen sterility and such situation was encountered in the species hybrids of *Gossypium* (Sarvella and Stojanovic 1968).

The factors that cause accumulation or depletion of certain free amino acids in the flower may be manifold. The differences recorded in amino acid composition of sample materials of P3 accessions may not be due to environmental influence because all the plants were grown under the same environmental conditions, but probably due to gene or gene cytoplasmic interactions.

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