RESEARCH ARTICLE

Amino acid analysis of three accessions of *Physalis philadelphica*

Rao Padmavathi S

P.G. Dept. of Botany, J. M .Patel College, Bhandara - 441904 (MS), India

Address for correspondence Email: sgvrao@rediffmail.com

Manuscript details:

Received: 27 September, 2014
Revised : 23 November, 2014
Accepted: 04 February, 2015
Published : 30 March, 2015

Editor: Dr. Arvind Chavhan

Cite this article as:
Rao Padmavathi S (2015) Amino acid analysis of three accessions of *Physalis philadelphica*, *Int. J. of Life Sciences*, 3(1): 115-117.

ABSTRACT

Physalis philadelphica 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. A steroid Physalin extracted from leaves and roots has prophylactic and therapeutic properties for treating infections caused by protozoans. Also it is used in autoimmune diseases and it acts as anti-leukemic agent. The Mexican people use decoction of calyces for diabetes. 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. Therefore with a view to study the biochemical variability, three accessions of *Physalis philadelphica* from different sources were collected and to employ these three accession in biochemical investigations to study qualitative and quantitative analysis of free and protein amino acids and their effect on the morphology of the three accessions.

Keywords: Accession, Free Amino acid, *Physalis*, Protein Amino acid

INTRODUCTION

Physalis philadelphica 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. Keeping in view, three accessions of *Physalis philadelphica* were collected from different sources. All these three accessions had a significant difference in pollen fertility of flower. On the basis of their

pollen fertility they were named as P1, P2, P3. In view of the variations in the pollen fertility, the flowers of these three accessions were studied for free and protein amino acids by using AUTOMATIC AMINO ACID ANALYSER.

MATERIALS AND METHODS

The seeds of different accessions of *Physalis pheladelphica* was collected from different sources were given in the Table :1

Table 1:

S.No	Accession	Source	Collected by
1	P1	U.S.A. E.C.No.291558	George, A White Plant introduction officer, Maryland.
2	P2	U.S.A. E.C. No.291559	-do-
3.	P3	U.S.A. E.C.No.270459	Director, Royal Botanical Garden, KEW.

Method The fresh flowers of P1, P2 & P3 accessions were collected for the estimation of free and protein amino acids by using Automatic Amino Acid Analyser.

RESULTS AND DISCUSSION

Seed germination and survival rate of *Physalis philadelphica* were slightly less in P3 compared to P1 and P2. In contrast to P1 and P2, in P3 the flowering was one week delayed and pollen fertility and seed set were significantly reduced.

In view of significant variation in their pollen fertility, the flowers of the three accessions were studied for free and protein amino acids by Amino Acid Analyser. Free and protein amino acids and their quantities in the fresh flowers of the three accessions were compared, each accession presented a different pattern, as can be expected from the fact that they were affecting different morphological parameters. In addition to the amino acids present in the standard aminogram some peaks were present in the aminograms of three accessions representing unknown amino acids.

Amino acids aspartic acid, cystine and methionine were present in the flowers of the P1 and P2 and were in traces in P3. On the other hand amino acids leucine, threonine and serine were present in the flowers of the P3 and were in traces in the flowers of P1 and P2.

Table 2: Free and protein amino acid composition (micromoles/gram) of fresh flowers of (P_1,P_2 & P_3) *Physalis philadelphica*.

Amino acid	P1		P2		P3	
	Free amino acid	Protein amino acid	Free amino acid	Protein amino acid	Free amino acid	Protein amino acid
Aspartic acid	1.5	2.5	0.50	0.02	*	0.001
Throenine	0.001	0.5	0.001	0.80	3.50	*
Serine	0.01	2.0	*	0.01	0.13	1.9
Glutamic acid	*	8.0	1.10	6.50	4.10	*
Proline	*	106.6	*	108.0	*	29.2
Glysine	2.7	25.3	0.50	23.4	*	*
Alanine	*	*	0.10	*	*	72.1
Cystine	1.5	103.0	1.20	102.0	*	10.0
Valine	*	62.7	1.10	60.5	0.20	21.2
Methionine	0.01	2.8	0.80	7.90	0.001	7.60
Isoleucine	0.01	29.2	0.30	28.5	0.01	38.1
Leucine	0.01	8.5	0.001	6.50	0.06	19.3
Tyrosine	0.025	18.4	0.01	19.1	0.001	6.50
Phenylalanine	0.32	25.7	1.11	27.1	0.01	47.9
Histadine	0.15	18.3	0.16	16.8	0.80	25.8
Lysine	0.006	13.8	0.01	12.8	*	26.1
Arginine	*	*	*	*	*	18.7
Total	**6.242**	**427.30**	**6.892**	**418.93**	**8.813**	**344.20**

Amino acid composition of the flowers of the P3 permits several kinds of comparisons. In protein amino acids, glutamic acid was missing in P3 while it was present in some quantity in P1 and P2. This amino acid accumulated as free acids in the flowers of the P3. Indeed these are the only two amino acids to accumulate as free acids while others present in traces. Secondly, glycine was absent either as free or protein amino acid in the P3, while it was present in considerable quantity among the free and protein amino acids of the P1 and P2. Thirdly, P_3 has greatly reduced quantities of proline , cystine, valine and tyrosine. Fourthly, the only amino acid that was significantly in excess of the P_3 was arginine which was lacking in the P1 and P2 either as free or as a protein acid. All these features point out a gross deficiency of total proteins and a significantly altered protein composition of the P_3 accession.

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 these three accessions 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 steriles of *Gossypium* over their non-segregating male fertile and they attributed this phenomenon to a partial block of protein synthesis.

The P3 accession in the present study was by and large partial pollen sterile and it differ in its degree compared to P1 and P2 accessions, which were highly pollen fertile. 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 P_3 compared to P1 and P_2. 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 in P_3. 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.

REFERENCES

Britikov EA, Schrauwen J, Linskens HF (1970) Proline as a source of nitrogen in plant metabolism. *Acta. Bot. Neert.* 19:515-520.

Coleman RG, Hegarty MP (1957) Metabolism of dornithine in normal potassium deficient barley. *Nature* 179:376-377.

Duvick D (1965) Cytoplasmic pollen sterility in corn. *Adv.Gent.,* 13:1-56.

Fukasava H (1962) Biochemical mechanism of pollen abortion and other alterations in cytoplasmic male sterile wheat. *Seiken Ziho* 13:107-111.

Kaul MLH (1997) Male sterility in higher plants. *Theoretical Applied Genetics* 10:78-81.

Patterson WJ, Scott RA, Carns HR, Hedin PA (1966) The male sterile response in cotton. The effect of sodium 2,3 dichloro-2-methylpropionate (FW-450) on the incorporation of amino acids in floral tissue. *Phyton* 23: 43-48.

Sarvella P, Stojanovic BJ (1968) Amino acid analysis of the species in the genus *Gossypium*. *Can. J. Gent. Cyto* 10:362-668.

Vogel HJ, Bonner, DM (1954) On the glutamate proline-ornithine interrelation in *Neurospora crassa*. Nat. Acad.Sci. (USA), 40:688-694.