CAPSICUMM ANNUUM'S VITAMIN C BIOSYNTHESIS

Mariana Bei, Atanase Dalea, Jude Eugen*

*University of Oradea, Faculty of Environmental Protection, 26 Gen. Magheru St., 410048 Oradea; Romania, e-mail domocosmariana@yahoo.com

Abstract

Influencing physiological processes of plants, with the help of chemicals, has been an older concern of physiologists, biologists, gardeners and farmers, etc., managing to establish the stimulating and inhibitory effects, which are dependent on the administered quantities and the phase of vegetation in which the treatment with the respective compound is applied.

Pepper contains 4-6 times more vitamin C than lemon juice, contains significant quantities of mineral salts - Ca, P, Fe, Na, K, Mg, and protean substances. The fruit of some varieties contain also some substances that made the pepper to be used in the pharmaceutical and dye industry.

Key words: Capsicumm annuum, role of phyto-regulators, extraradicular treatment

INTRODUCTION

The present-day agriculture, considered a "traditional agriculture", needs to be replaced, because through the use of increased quantities of fertilizer and phyto-pharmaceutical substances - in order to achieve bigger crops per hectare - the quality of food diminishes and the rate of illnesses among people increases. In this process the phyto-regulators will have an important role in increasing production per hectare, in an organic farming, which takes into account all the environmental factors in the wider natural connections.

Provision of modern cleaner technologies is an integral part of the global policy of environmental protection, within which the human health is one of the main components.

MATERIAL AND METHODS

The experiments are performed for the pepper's cultivation because of the vitamin C content and its active role in the carbohydrates metabolism, in providing the muscle activity in sustained effort that requires energy consumption and performance time and that, in the absence of vitamin C, causes the accumulation of lactic acid, metabolic disturbance and decreased muscle efficiency.

In this respect the intensification of the development of vegetables and fruit production is pursued in order to ensure the needs of the population and market in general. This intensification was achieved due to growth bio-stimulating treatment of pepper plants.

Of the vegetable species, pepper has a major place, having many uses. It has a very high content of vitamin C -100-300mg/100g, 5.4% mineral salts and sugars (Ca 12mg, P 25mg, Fe 0.4 mg to 100 mg of fresh substance). Out of he pepper fruits food colors can be extracted having a great importance in industry. Ascorbic acid is a substance susceptible to oxidation, however the crystalline form is set out in the presence of air. In dilutions it is very fast oxidized, in proportion to the dilution's alkalinity. In acid dilution it is relatively stable, stability that can be enhanced by the presence of reducing agents, such as gluthathione and cysteine. Reducing properties of ascorbic acid have allowed the creation of marking out cytochemical methods in different cells.

Generally, the vitamin C is present in all cells with intense activity. The links between vitamin C and carbohydrates metabolism are quite important. This link is accentuated also in the study of muscle activity and effort. Between vitamin C and protean metabolism there is a correlation that appears also from its interrelation with different enzyme systems.

In order to conduct the experiment the following materials have been used: tubes, filter paper, graduated pipettes, distilled water, mortar with pestle, burette, analytical balance, dilution of KIO_3 n/250 dilution of HCl 2%, quartz sand, measuring bottle, measuring bottle of 100 ml, Erlenmayer glass of 100 ml, starch glue, dilution of pepper leaves and fruit A.I.A. (1 mg / l, 3 mg / l, 5 mg / l, 10 mg / l), GA3 dilution (1 mg / l, 3 mg / l, 5 mg / l, 10 mg / l) dilution of 2.4 - D (1 mg / l, 3 mg / l, 5 mg / l, 10 mg / l).

Vitamin C has been determined from the 30, 35, 45 days old pepper leaves and fruit.

DETERMINATION OF VITAMIN C BY IODOMETRIC METHOD

In the case of plant extracts, this method gives generally higher values than the method based on the use of diclorfenolindofenol reagent 2.6. Because of its simplicity and celerity, the iodometric method is still used for serial tests to the same species of plant, when the resulted data give comparable values. Iodometric method uses the iodine as oxidizer, iodine that comes from the iodized action on potassium iodide:

$KIO_3 + 6HCl + 3KI = 3I_2 + 6\ KCl + 3H_2O$

$I_2 + H_2O = O + 2HI$

One atom of oxygen oxidizes a molecule of ascorbic acid, respectively an equivalent gram of oxygen oxidizes ½ mole of ascorbic acid: 176.12 / 2 = 88.06 g. A dilution of KIO_3 n/250 (0.1427 g/1000ml) is used. The titer of dilution in vitamin C is: 1 ml n/250 KIO_3 = 0.0003522 mg vitamin C.

From an average sample made of examined material (fruit, vegetables, etc.). 1-20 g is taken. The weighing can be done using a technical balance

with an accuracy of 0.01 g or an analytical balance. The weighted material is grinded in a mortar with pestle with a bit of dilution of HCl 2% and 5 g of quartz sand or powdered glass, until a homogeneous paste is obtained (about 10 minutes). 40-50 ml dilution of HCl 2% is added and after a short mixing it is left to settle out for a few minutes, then it is filtered in a measuring bottle of 100 ml (or 250 ml, depending on the amount of vitamin C). The material remained in the mortar is washed 3-4 times with HCl 2% levigating and filtering the dilution and washing the measuring bottle. Thenceforth it is brought to the sign with HCl 2% and strongly stirred.

In an Erlenmayer of 100 ml 10 ml of the obtained extract is instilled and 30 ml of distilled water, 5 ml of potassium iodide 1%, 5 ml HCl 2% and 5 ml of starch glue 0.2% as an indicator are added. It is titrated using a solution of KIO_3 n/250 up to dark blue persistent 30 seconds.

The calculation results:

$$\text{Vitamin C (mg\%)} = \frac{a \times 0{,}3522 \times C \times 100}{n}$$

a - is the number of KIO_3 milliliters used for titration
C - is the coefficient of titration, in this example 1
N - is the weight of the analyzed sample expressed in grams.

For the determination of the vitamin C content in the pepper plants, the determination of the pepper plants growth dynamics was observed by measurements. Measurements of the height of the pepper plants stalk have been performed at different ages, 5, 8.13, 20, 30 days. For each experimental batch to which a concentration of the growth substance has been applied, 15 measurements have been performed and an arithmetic average between them was done.

RESULTS AND DISCUSSION

The data show that the treatment with the application of β-Indolil acetic acid (A.I.A.) determines the intensification of the pepper plant growth, determining also the increase of vitamin C content and treatments with higher concentrations had an inhibitory action.

Following the treatment with acid Giberelic (GA_3) in the concentration of 1 mg / l the intensification of plant growth and the content of vitamin C has been revealed. With concentrations of 10 mg / l an inhibition of pepper plants growth is detected. Also the 2.4 diclorfenoxiacetic acid (2,4-D) determines an intensification of the plant growth in treatments with low concentrations. Application of concentrations over a certain limit slow down the growth of the plants and the quantity of vitamin C.

CONCLUSIONS

The influence of some bio-stimulating substances over the synthesis of one of the most important vitamins was observed, to a crop plant with great frequency in the gastronomic tradition and that is one of the most common sources of vitamin C for most of the people.

The application of some phyto-regulators like the acid β-Indolil acetic (AIA), in small amounts of 1mg/l - 3mg/l stimulates the plant growth and the synthesis of vitamin C in peppers. These concentrations are considered optimal.

The action of the Giberelic acid (GA_3) in concentrations of 1mg / l stimulates the plant growth and the accumulation of vitamin C in pepper plants. In higher concentrations (3mg/l - 10 mg/l) the GA_3 have an inhibitory action on pepper plants.

The action of the 2.4-dichlorfenoxiacetic acid in small concentrations of 1 mg/l determines the intensification of the increase and synthesis of vitamin C. In higher concentrations (3 mg/l-10 mg/l) it has an inhibitory action on pepper plants. In the experiment the increased capacity of water retention and the provision of an optimal water exchange on the biosynthesis of vitamin C has been noted.

REFERENCES

1. Berkkessy J., Trifu M.,Floca L., Berkkessy C., 1995-1996, Influența fitoregulatorilor de creştere şi asupra procesului de transpirație la pătlăgelele vinete, Contribuții Botanice, pag. 231-234;
2. Boldor O., Trifu M., Raianu O., 1981, Fiziologia Plantelor, Ed. Didactică şi Pedagogică, Bucureşti.
3. Boldor O., Trifu M., Raianu O., 1981, Fiziologia Plantelor – Lucrări practice, Ed. Didactică şi Pedagogică, Bucureşti.
4. Gergen I., Lăzureanu A., Goian M., Borza I., Puşca I., Vălceanu R., 1988, Utilizarea bioregulatorilor în producția vegetală, Editura Facla.
5. Gherghi I., Burzo I., Mărgeanu L., denes S., Dobreanu M., Dattantyus K., 1983, Biochimia şi fiziologia legumelor şi fructelor, Editura Academiei R.S.R., Bucureşti.
6. Neamțu G., Irimie F., 1991, Fitoregulatori de creşetere, aspecte biochimice şi fiziologice, Editura Ceres, Bucureşti.
1. 9. Shaddad M. A., , Radi A., Ahmed M., and El-Tayelo, 1989, Effect of fitohormone on some drought stressed crop plants: Plant water relations and mineral composition, Bioplant (Prague), 31(5), pag. 354-360.