INFLUENCE OF KINETIN (K) ON ORGANOGENESIS OF SOYBEAN IN VITRO

Daniela Marele *

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

Abstract: *In vitro regeneration and organogenesis at some species of plants is an essential condition to accomplish vegetative multiplication. In our experiments cytokinins were used for making the culture medium more effective. The nature of the phytohormones used, and also their concentration, the differences of the hormonal balances have an important role in the organogenesis processes.*

Key words: soybean, kinetin, organogenesis, cytokinin, phytohormons

INTRODUCTION

Soybeans (*Glycine max* (L) Merril), are a major source of edible protein and is one of the most important agricultural crops in the world (SMITH and HUYSER, 1987).

It was shown that soybeans shows a remarkable plasticity of response to mutagens stimuli, regeneration can be achieved by forming a bipolar structure with cotyledons and roots (Corneanu, 1989).

Since 1892 WEISNER noticed the possible presence of a specific substance which, in very small concentrations, triggers and stimulates the cellular division. The first substance of this kind was insulated since 1955, namely the cytokinin – ***kinetin*** (6-furfurilaminopurine) which was demonstrated stimulating caulogenesis, respectively neoformation of buds at inocula level of yielding stems.

Of the large variety of purine nucleus derivates substance the following cytokine chemical compounds are used frequently in the *in vitro* phyto culture : 2-izopentyl-adenine , natural cytokinins ,kinetin (K) (6 furfurylaminopurine) and BAP (6-benzyl-aminopurine).

It was noticed only later that that cytokinin include substances that determines a large number of growing and physiological effects related to cell division, cell growth through extension, plants' differentiation and organogenesis.

Neoformation of an organism is an event that, when starting from a differentiated cell calls for non-operation of numerous physiological processes leading to mitotic activity by means of which one meristematic cell acquires the capacity to divide itself again. According to BIGOT (1980) this activation precedes organogenesis phase that characterized either by immediate operating of "pattern" of an organ following a well-

established schedule or by forming a mass of unorganized cells (callus) where the organogenesis capacity is materialized later.

In organogenesis terms one may consider plant as being made of two concentric layers, one superficial with the ability to form buds and an in-depth one, characterized by its rhyzogene capacity.

This experiment studies the kinetin (K) (6 furfurylaminopurine) at a concentration of 0.5 to 3.0 mg/ l. Soybean cultivars, used in this study is Diamond, Pearl and Agate, introduced in the Murashige-Skoog (1962) environment.

RESULTS AND DISCUSSION

The active caulogenesis operation is due to the K effect on stimulating on cell division, thus being favourable for essential changes in the mitotic cycle, reducing the duration of pre-synthetic gap phase (G1) within the mitotic cycle, increasing the DNA synthesis rhythm (S), and extending the period of pre-synthetic phases.

The kinetin (K) has no rhyzogene effects and thus having impact on callusogenesis and especially on caulogenesis.

If in the absence of cytokinins, the cells are not dividing (are lacking development), depending on their nature, concentration, inocula type, the ratio between these and other existing phytoregulators existing in the environment, the specific culture - they may cause the formation of somatic embryos or even triggering the neogenesis of the latter (CACHIȚA-COSMA şi colab., 2004)..

Tabel 1

Influence of kinetin (K) on organogenesis of soybean neoplantules from apical meristeme

Cultivar	K (mg/l)	*Evolution of organogenesis %*			
		No development	*Calusogenesis*	*Risogenesis*	*Caulogenesis*
Diamant	0,0	100,0	0	0	0
	0,5	40	31	0	53
	1,0	40	44	0	61
	1,5	46	44	2	63
	2,0	36	35	1	52
	3,0	39	30	0	48
	%	40,2	36,8	0,6	54,6
Perla	0,0	100,0	0	0	0
	0,5	43	38	0	50
	1,0	40	38	1	63
	1,5	32	53	1	60
	2,0	28	36	1	50
	3,0	36	29	0	42

	%	35,8	38,8	0,6	53,0
Agat	0,0	100,0	0	0	0
	0,5	25	41	1	58
	1,0	20	44	2	62
	1,5	20	52	2	70
	2,0	27	38	3	60
	3,0	30	28	1	38
	%	11,4	40,6	1,8	57,6
$\overline{X}$ /genotip		**29,1**	**38,7**	**1,0**	**55,1**

One may clearly notice that concentration increase from 0.5 to 2.0 mg/ l has a significant effect on the existing caulogenesis phenomenon yet with differences in the cultivars. Thus, at the level of the latter, the phenomenon ranges from 53.0% for the Pearl variety, up to 57.6% at Agat variety, which demonstrates the individual reaction of soybean genotypes to the effects of various concentrations of cytokinin (K) in the culture medium.

When using K in the basic culture medium, the lack of rhizogenesis may raise problems in the formation of normal neoplants. In this regard one may notice also at low percentage, some genotypic differences i.e. Diamond and Pearl varieties show a 0.6% rhizogenesis process and the Agat variety presents a 1.0% rhizogenesis.

CONCLUSIONS

Phyto-physiological effects of cytokinine, can be summarized in general, as follows: depending on their concentration and types, *in vitro* breeding they stimulate the forming of adventitious shoots and small stems (caulogenesis), being, in general, antagonistic to risogenesis; the cytokinines serve to maintain cell viability, by supporting new plantelets capacity to survive and fostering the cells dedifferentiation and multiplication, and prevents senescence.

Cytokinins stimulate cell division, play a role in the synthesis of ethylene which, at its turn, stabilizes the endogenous level of auxin, influences cell growth, has a net rhyzogene action, and inhibits the formation of somatic embryos in cell suspensions.

The results lead us to recommend the moderate use of cytokinins to the basic environment, varying within the recommended limits made by GAMBORG et al. (1968).

Specifically, the phytohormones guide *in vitro* development processes.

REFERENCES

1. Ardelean, M., 1979, Cercetări privind transmiterea ereditară a caracterului "păstăi terminale" şi posibilităţile de utilizare a acestuia în ameliorarea genetică a soiei, Teză de doctorat, Institutul Agronomic Cluj-Napoca
2. Bandici, G.E, 2001, Fiziologia plantelor, Ed. Dacia Cluj-Napoca
3. Cachiţă-Cosma, Dorina, Camelia Sand, 2000, Biotehnologie vegetală, Ed. Mira Design Sibiu
4. Cachiţă-Cosma,Dorina , C. Deliu, Lenuţa Rakosy-Tican, A. Ardelean, 2004, Tratat de biotehnologie vegetală, vol. I, Ed. Dacia, Cluj-Napoca
5. Corneanu, G., 1989, Elemente de radiobiologie vegetală, Ed. Ceres Bucureşti
6. Gamborg, O.L., R.A. Miller, K. Ojim, 1968, Nutrient requirements of suspension cultures of soybean root cells, Experimental Cellular Research, 50
7. Linsmaier, E.M., F. Skoog, 1965, Organic growth factor requirements of tobacco tissue cultures, Physiol. Plant., 51
8. Murashige, T., F. Skoog, 1962, A revised medium for rapid growth and bioassays with tobacco tissue cultures, Physiologia Plant., 15
9. Smith, K.J., W. Huyser, 1987, Soybeans: Improvement, Production and Uses, 2nd Ed. American Society of Agronomics, Madison
10. Tămaş, Elena, 1998, Cercetări privind influenţa mutagenă a unor factori fizici şi chimici în vederea obţinerii de mutaţii utile pentru procesul de ameliorare a bobului (*Vicia faba* L.), Teză de doctorat, USAMV Cluj-Napoca
11. Zăpârţan, Maria, Dorina Cosma-Cachiţa, P. Varga, M. Savatti, Florica Achim, 1991, The regenerative capacity of explants derived from forage leguminous plant (clover, lucerne, esparcet, bird's food trefoil), In the IVth Nat. Symp. on pl. cell and tissue cult., Cluj-Napoca