

UDC 632.5.01./08

GUNCHAKV.M., Candidate of Agricultural Sciences

SHEVAGA G.M., junior research worker

KORDULYAN R.O., academic secretary

Ukrainian scientific-research plant quarantine station PPI NAAS of Ukraine

KYRYK M.M., Doctor of biological sciences? professor, NAAS of Ukraine academician

National University of life and environmental sciences Ukraine

E-mail: ukrndskr@gmail.com

BIOLOGIC GROWTH REGULATOR «REGLALG» IMPLEMENTATION IN CULTURE *IN VITRO* ON POTATO PLANTS

The biologic effectiveness of «Reglalg» optimum norms implementation in process of sanitized potato plants clonal propagation is researched. It is established, that the norm 0,25-1 mg/L in culture in vitro is the optimal one for cuttings regeneration, new leaves/nodes creation, and a full plant formation. The lowest level of electrolytes leakage is determined, which is explained by increase of potato resistance to high temperatures and has a mediate effect on general resistance to diseases.

Keywords: potato, «Reglalg», clonal micropropagation, electrolytes leakage, plants in vitro

Introduction. In practice of potato productivity increase, a technology of non-viral potato plants clonal micropropagation, based on clonal microplants culturing on nutrient mediums *in vitro* has recommended itself quite well. The successful plants growing *in vitro* is provided, firstly, by a right nutrient medium selection, which corresponds to cultivated plants physiological peculiarities [1]. A nutrient medium mineral content provides balanced and sufficient potato plants nutrition with necessary nutrient elements [2].

It is known that all the components of nutrient medium can influence a clonal micropropagation process. For culturing plants *in vitro*, mediums are used which differ not only by mineral base, but also by composition of nutrient and biologically active matters [3].

During the recent years [4], over the world, along with plant protection chemical methods, for plants productivity increase, a biologic method has obtained a wide implementation. Nowadays, BAM (biologically-active matters) are broadly used, which provide plants protection from a wide spectrum of diseases, increase plants resistance at extremal climatic conditions by means of creating favorable conditions for plants growth and development. BAM stimulate yield development and supply its high productivity and quality [5]. Due to this, biologic means are used in agriculture, which are not harmful. «Reglalg» belongs to such preparations.

«Reglalg» is a biologic growth regulator – aglae extraction which includes a mixture of fatty acids, aldehydes, ketones, and other bio-active components. The preparation is ton toxic for humans. It induces the obtained plant resistance system. «Reglalg» acts as growth regulator. In certain concentrations, it simulates root growth, especially secondary ones. Plant growth and development depends on «Reglalg» concentration. The preparation is used for seed water-soaking, as well as for vegetative mass spraying at bushing phase. «Reglalg» increases resistance to fungal and viral diseases [6].

The research aim was to investigate «Reglalg» stimulating action on potato plants growth and development in conditions *in vitro* as means of potato varieties rapid propagation in the given conditions and the action of biologic growth regulator on potato plants resistance to different abiotic and biotic factors.

Materials and methods. The research has been performed at the Ukrainian scientific-research plant quarantine station PPI UAAS since 2012 up to 2013; potato plants of the variety Slovyanka has been used, cultured in conditions *in vitro*.

For a sanitized potato variety primary propagation, cuttings micro-propagation method has been implemented, as well as regenerant plants growing on artificial nutrient medium.

For potato plants culturing, a medium with mineral base Murashige and Skoog has been used [7], modified by Potato Production Institute NAAS of Ukraine [8]. The vitamins B₁, B₆, and ascorbic acid have been used. Into the medium of culture *in vitro*, 0,25-1mg/L «Reglalg» has been added. As a control, IAA in concentration 1mg/L has been used, adenine in concentration 0,2mg/L (the latter induces stems growth). A nutrient medium without IAA and adenine has also served as control.

On the 3-4-th day after cuttings planting, roots and stem growth has been starting. In 20-25 days, the cuttings have grown completely and created a full value plant.

Culturing regimes: temperature – 22±3 °C, air humidity – 70-75 %, luminosity – 2-3 thousand lux, photoperiod – 16 hours illumination.

For electrolytes leakage investigation, potato plant leaves have been used, cultured in conditions *in vitro*. Among the selected small leaves, round segments have been cut out (diameter 10mm), carried into vials, and embedded with 5 mL distilled water; after that, the incubation has been conducted for 15min at temperature 55 °C. Then, the vials have been chilled by immersing into water (room temperature) for two hours. Further, the water electric conductivity has been determined, where the leaf segments have passed incubation, on a device conductometer (manufactured by ELWRO, USA). After that, the vials have been carried into water bath for 30min at 100 °C; then chilled to 25 °C, and shaken for 1 hour at room temperature. Again, the water electric conductivity has been measured, where the leaves segments have been incubated [10].

Results and discussion. As a result of the performed research, a positive effect of biologic growth regulator «Reglalg» on sanitized plants growth and development is established. (Table 1).

Table 1

«Reglalg»- and its concentration effect on potato variety “Slovyanka” plants growth and development *in vitro*

Trial variants	Plant height, cm	Plant weight, g	Leaves quantity, pc	Root weight, g
Control (without IAA, adenine)	12,28±3,17	0,47±0,21	5,4±0,55	0,05±0,04
Control (IAA, adenine)	14,70±0,97	0,91±0,33	5,8±0,83	0,29±0,15
«Reglalg» 0,25mg/L	16,92±0,61	0,95±0,14	7±1,22	0,32±0,06
«Reglalg» 0,5mg/L	18,34±1,83	0,98±0,18	8±0	0,35±0,06
«Reglalg» 1mg/L	20,3±3,17	1,37±0,33	8,8±1,30	0,6±0,15

Therefore, in culture *in vitro*, the best plant growth has been recorded at «Reglalg» concentration 1mg/L of medium. Plants are less lengthened; stems thicken, leaves quantity and their surface area increases. At concentration 0,5 mg/L plants shorten by 1,96cm; plant weight reduces by 0,39g; and for keaves quantity *in vitro*, the stated «Reglalg» concentration had a less effect (0,8 %).

At control (IAA, adenine), compared to concentrations 0,25-1mg/L «Reglalg», the action on plants *in vitro* has reduced; as the plants height makes 14,7cm, cuttings reduce in number 3-fold according to concentration 1mg/L of medium, as well as the roots and plant mass. Also, the suppressure of leaf surface area is observed, compared to natural growth regulator content.

The research results of biologic growth regulator investigations have shown that the preparation «Reglalg» has a significant auxin activeness at different concentrations, and the control (IAA, adenine) in the recommended concentration has no accurate difference between IAA- and adenine-free control.

In laboratory conditions, the effect of BAM «Reglalg» various concentrations on electrolytes leakage is investigated (Fig. 1) from potato leaves segments after thermal shock (temperature +50 °C).

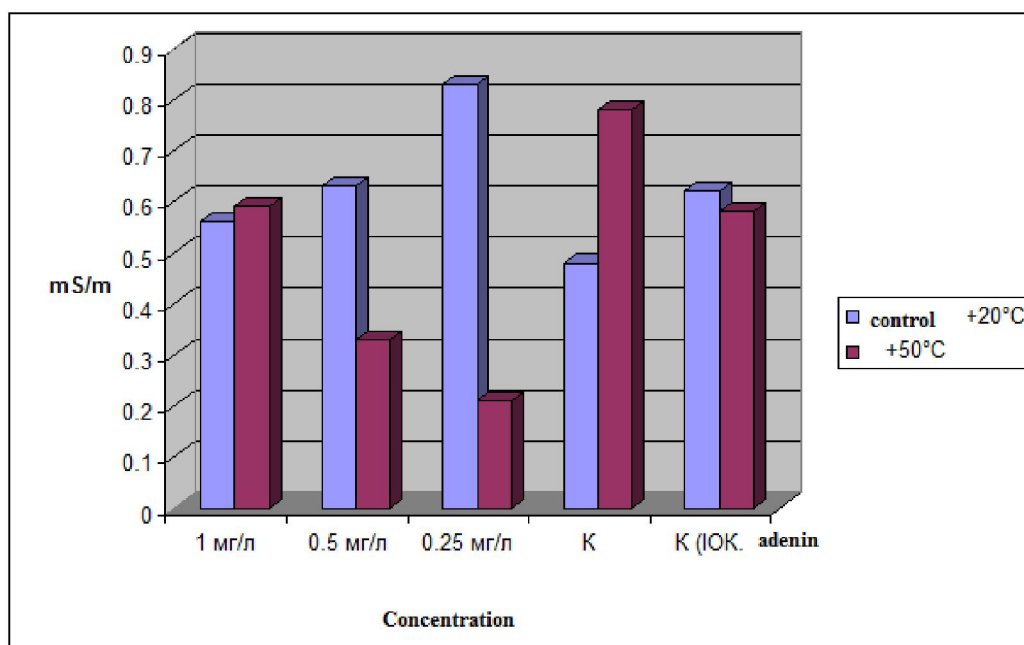


Fig. 1 Electrolytes leakage from potato leaf segments after growing in culture *in vitro* at high temperature action

The analyses results show that different concentrations of «Reglalg» significantly influence the membranes structure and functions. This is confirmed by exoosmos changes under effect of bioactive matter different concentrations. As a result of such physiological and biochemical processes, the cells metabolites are maintained which increase plants resistance to various abiotic and biotic factors.

As a result of the conducted research, a positive «Reglalg» effect is determined for increasing potato resistance to high temperature, and mediately on general resistance to diseases. It is established, that at low BAM concentration 0,25 %, the lowest level of electrolytes leakage has been determined. Thus, a conclusion may be made that such a concentration is the most effective. The electrolytes leakage level at «Reglalg» high concentrations (1 %) is almost equal to the same indicator in control and at IAA implementation. The less effective action is shown by higher «Reglalg» concentrations.

Plants stress-resistance increase is achieved due to conditioning and reaction acceleration – plants response to unfavorable factors effect. Therefore, the implementation of «Reglalg» may provide solution of agriculture ecologization.

Conclusions. In culture *in vitro*, the implementation is reasonable of biologic growth regulator – «Reglalg», in concentration 0,25-1mg/l as a medium ingredient, with the aim of plants biometric indicators improvement *in vitro*, and for rapid potato plants clonal micropropagation.

At investigating the biologically active matter «Reglalg» different concentrations effect on electrolytes leakage, the lowest level of electrolytes leakage has been researched at low concentration, which increases potato plants resistance to various abiotic and biotic factors.

Further research prospects. The work will be continued directed to determination of «Reglalg» various concentrations effect at culturing sanitized potato varieties in culture *in vitro*, and plants adaptation *ex vitro*.

References

1. Калинин Ф.Л. Технология микрклонального размножения растений / Ф.Л. Калинин, Г.П. Кушнир, В.В. Сарнацкая. – К.: Наукова думка, 1992. – 232 с.
2. Мельничук М.Д. Біотехнологія рослин. Практикум: навч. посіб. для студ. ВНЗ / М.Д. Мельничук., І.П. Григорюк, Т.В. Новак – К.: ТОВ «Аграр Медіа Груп», 2011. – 216 с.
3. Боднарчук А.А. Наукові основи насінництва картоплі в Україні / А.А. Боднарчук. – К., 2010. – 400 с.

4. Daskalyuk A. Elimination of dormancy germination and electrolyte leakage from apple embryos during stratification / A.P. Daskalyuk // Russian j Plant Physiol. – 2002. – V.49 – №5. – P. 804 – 810.
5. Мельник П.О. Визначення стійкості рослин до високих температур методом витоку електролітів / П.О. Мельник, І.І. Мойса, О.Р. Доскалюк // Вісник аграрної науки. – 2006. – жовтень. – С. 44-46.
6. Dascaluc A. Influence of heat shock on chlorophyll fluorescence of white oak (*Quercus pubescens* Wild) / A. Dascaluc, T. Ralea, P. Cuza. // Photosintetica. – 2007. – № 45 (3). – P. 469-471.
7. Murashige T.A revised medium for rapid growth and bio-assays with tobacco tissue cultures / T. Murashige, F. Skoog // Physiol. Planta. – 1983 – № 157 – P. 385-391.
8. Оздоровлення сортів картоплі методом культури апікальних меристем: методичні рекомендації / [Т.М. Олійник, К.А. Слободян, О.О. Шевченко та ін.]; Ін-т картоплярства НААН. – Немішаєве: ТОВ “КВІЦ”, 2012. – 28 с.
9. Методичні рекомендації щодо проведення досліджень з картоплею / [В.С. Куценко, А.А.Осипчук, А.А. Подгаєцький та ін.]. – Немішаєве, 2002. – 182 с.
10. Зауров О.А. Кинетика экзоосмоса электролитов теплолюбивых растений при действии пониженных температур / О.А. Зауров, А.С. Лукаткин // Физиология растений. – 1985. – Т. 32, Вып. 2. – С. 347.

Анотація

Гунчак В.М., Шевага Г.М., Кордулян Р.О., Кирик М.М.

Застосування біологічного регулятора росту «Reglalg» в культурі *in vitro* на рослинах картоплі

*Досліджено ефективність застосування біологічного регулятора росту «Reglalg» у процесі клонального мікророзмноження оздоровлених рослин картоплі. Установлено, що норма 0,25-1мг/л в культурі *in vitro* є оптимальною для регенерації живців, утворення нових листків (вузлів), формування повноцінної рослини. Визначено найнижчий рівень витоку електролітів, що пояснюється підвищенням стійкості картоплі до високої температури та опосередковано впливає на загальну стійкість до хвороб.*

Ключові слова: картопля, «Reglalg», клональне мікророзмноження, витік електролітів, рослини *in vitro*

Аннотация

Гунчак В.М., Шевага Г.Н., Кордулян Р.О., Кирик Н.Н.

Применение биологического регулятора роста «Reglalg» в культуре *in vitro* на растениях картофеля

*Показана биологическая эффективность применения оптимальных норм «Reglalg» в процессе клонального микроразмножения оздоровленных растений картофеля. Установлено, что норма 0,25-1мг/л в культуре *in vitro* является оптимальной для регенерации черенков, образования новых лепестков (узлов), формирования полноценного растения. Определён самый низкий уровень вытекания электролитов, что объясняется повышением устойчивости картофеля к высоким температурам и косвенно влияет на общую резистентность к заболеваниям.*

Ключевые слова: картофель, «Reglalg», клональное микроразмножение, вытекание электролитов, растения *in vitro*