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14. Паламарчук І.І. Вплив сортових особливостей на врожайність та біометричні показники продукції буряка столового в Правобережному Лісостепу України. *Збірник наукових праць Вінницького національного аграрного університету. Сільське господарство та лісівництво*. №9. Вінниця. 2018. С. 144-153.

15. Паламарчук І.І. Вплив строків сівби на формування врожаю буряку столового в правобережному Лісостепу України. *Вісник уманського національного університету садівництва*. №1. 2020 р. С. 54-58.

16. Паламарчук І.І. Динаміка формування площі листків рослин буряка столового залежно від сортових особливостей та строку сівби в умовах правобережного Лісостепу України. *Збірник наукових праць Вінницького національного аграрного університету. Сільське господарство та лісівництво*. №4(15). Вінниця. 2019. С.173-182.

17. Петриченко В. Ф. Землеробство з основами екології, ґрунтознавства та агрохімії: навч. посіб. [та ін]. К.: Аграрна наука, 2011. 492 с.

18. Сич З. Д., Кліщенко С.В., Андрушко А.Ю. Про виробництво і споживання овочів у США. Економіка АПК. 2004. С.155-158.

19. Сучасні технології в овочівництві [Яковенко К.Л., Горова Т.К., Ящук А.Л. таін.]; за ред. К.І. Яковенка Харків: ІОБ УААН, 2001.128 с.

20. Федерація органічного руху в Україні [Електронний ресурс]. Режим доступу : http://www.organic.com.ua.

21. Vdovenko S.A., Palamarchuk I.I., Pantsyreva H.V., Alexeyev O.O., Vdovenko L.O. Energy efficient growing of red beet in the conditions of central forest steppe of Ukraine. *Ukrainian Journal of Ecology*, 2018, 8(4), 34-40.

DYNAMICS OF HEIGHT AND DENSITY INDICATORS FORMATION OF PLANTS IN THE STUDIED SOYBEAN VARIETIES DEPENDING ON PRE-SOWING TREATMENT OF SEEDS

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Abstract

The results of the research on the study of pre-sowing treatment of soybean seeds with biostimulant and bioinoculant in the experimental field of Vinnytsia National Agrarian University are presented. Peculiarities of phenological development of the studied soybean varieties are established. Peculiarities of formation of one of the most important components of soybean crop formation formation - plant density at the time of germination and their survival, the number of plants per unit area before harvesting are analyzed.

According to the results of research conducted at the experimental sites, the effect of seed treatment with biostimulant and bioinoculant on field germination, density and survival of plants of the studied soybean varieties was revealed. It is established that on average for 2019-2020, depending on the action of intensification factors, the field germination of soybeans also changed, which influenced the formation of the plant density indicator for the period of full germination. As a result of the conducted researches, the influence of seed treatment with microelements and strain of nitrogen-fixing bacteria on the dynamics of plant height formation of soybean varieties was also revealed.

Keywords: variety, biostimulator, bioinoculant, plant preservation factor, plant height.

The problem formulation. Field germination of seeds - the main indicator of seedling quality - is a percentage of the number of sown similar seeds [1]. According to scientists [8], obtaining friendly and full seedlings of optimal density is the key to obtaining a high yield. According to research [10], reducing the field germination of seeds by 1% reduces the yield of spring cereals by 1-2%, winter wheat by 1-1.5%; field germination of seeds is usually: in cereals - 60-65, legumes - 70-75, sugar beets - 45-60, perennial grasses - 30-40, flax and hemp - 70-75%, which leads to significant yield losses. The height of the plant, its lodging and the height of attachment of the lower beans are one of the main features of soybeans, which determine its suitability for full mechanized cultivation from sowing to harvesting. The height of plants varies depending on the variety, year of cultivation, soil and climatic conditions and agronomic techniques used [13].

Due to the height of the plants, the number of productive nodes may increase (varieties with incomplete type of growth are indeterminate), but this feature is undesirable due to shading of the lower tiers, while reducing the inflow of solar insolation to the plant. In the future there is a struggle for assimilators between the vegetative mass of the plant and the generative, where the first indicator falls. This feature is inherent in the old varieties and varieties that are grown under irrigation in conditions of sufficient heat supply [11, 14].

Analysis of recent research and publications. A significant volume of publications is devoted to the problems of selection, cultivation and processing of soybeans and the use of growth regulating and stimulating drugs [1-5, 7, 9]. Seed treatment with plant

growth regulators stimulates the process of their germination, increases germination and significantly accelerates the growth and development of plants [6]. Plant growth regulators create a certain microbiological and biochemical environment around the sown seeds, stimulate the growth of seedlings, increase the resistance of seedlings to diseases, adverse environmental conditions, increase the activity of beneficial microflora in the soil [6, 9]. Other indicators of the yield structure of soybean plants also significantly depend on varietal characteristics [4]. Soybeans are quite sensitive to both direct action and aftereffects of fertilizers. It is possible to grow a high yield only if its need for fertilizers is fully met. Nitrogen is of particular importance for soybeans [5].

The high cost of nitrogen fertilizer production has led to the interest of farmers in biological nitrogen [6]. Symbiotic nitrogen fixation is an economically attractive and environmentally safe means of reducing the use of mineral nitrogen fertilizers in agricultural production [7]. Due to biological nitrogen fixation, soybean satisfies its need for nitrogen by 25-75% depending on growing conditions [8]. It is due to biological nitrogen fixation that the application of mineral nitrogen fertilizers under soybeans is ineffective [9]. In addition, nitrate nitrogen introduced into the soil is one of the main inhibitors of the symbiosis of nodule bacteria and soybeans [10, 12].

Presentation of the main research material. The indicator of plant density at the time of germination and their survival, the number of plants per unit area before harvesting is one of the most important components of soybean yield formation.

According to the results of research conducted at the experimental sites, the effect of seed treatment with a biostimulator and bioinoculant on field germination, density and survival of plants of the studied soybean cultivars was revealed. It was found that on average in 2019-2020, depending on the action of intensification factors, the field germination of soybeans also changed, in the Monada variety from 83.9 to 87.6% and in the Madison variety from 89.4 to 91.6%, which influenced the formation of the plant density indicator for the period of full germination of Monad variety - 50.8-52.9 pcs / m^2 and Madison variety - 54.1-55.4 pcs / m^2.

The seed germination rate in the Monada variety increased to 87.6%, and in the Madison variety - up to 91.6%, while the plant density was formed at the level of 52.9 and 55.4 pcs / m^2, respectively. Seed treatment in combination with the use of mineral fertilizers to some extent reduces the suppressive effect of mineral fertilizers and provides increased field germination of soybean plants. This phenomenon is due to the activation of physiological and biochemical processes in seeds and seedlings of soybeans due to inoculation of seeds with a strain of nodule bacteria in the bioinoculant and treatment with trace elements (table 1).

Table 1.

Dynamics of plant density of the studied soybean varieties during the growing season depending on the presowing treatment of seeds 2019 – 2020

Presowing seed treatment	Density of plants in the germination phase, pcs / m^2	Seed germination,%	Plant density during harvest, pcs / m^2	Plant conservation rate,%
Monada				
Without processing (control)	52,0	86,1	36,8	70,0
Stimpo (25 mg / t)	52,6	86,9	38,2	75,8
Rhizolin (2 l / t)	50,8	83,9	37,5	71,9
Stimpo(25 mg / t) + Rizoline (2 l / t)	52,9	87,6	41,7	80,8
Madison				
Without processing (control)	54,1	89,4	37,6	68,2
Stimpo (25 mg / t)	54,9	90,9	37,6	69,7
Rhizolin (2 l / t)	54,2	89,6	37,4	68,3
Stimpo(25 mg / t) + Rizoline (2 l / t)	55,4	91,6	41,6	78,6

The decrease in soybean plant density was associated with vegetation conditions that were characteristic throughout the period of plant growth and development. The main reason for the decrease in the number of plants per unit area is that they are damaged by diseases, pests, exposed to adverse weather conditions, herbicides and mechanical damage caused by agronomic measures during the growing season. At the time of harvest, the stocking density of soybean plants of the

Monad variety was 36.8-41.7 units / m^2, and the Madison variety - 37.4 - 41.6 units / m^2.

Seed treatment with Rhizolin bioinoculant and Stimpo biostimulator had a positive effect on plant survival. The plant survival rate in Monada and Madison was highest (80.8% and 78.6%) in the variants of the experiment where seeds were treated with Rhinoline bioinoculant in combination with Stimpo biostimulator, where the number of plants at harvest was 41.7 and 41.6 pcs / m^2.

As a result of research, to determine the impact of seed treatment with trace elements and a strain of nitrogen-fixing bacteria on the dynamics of plant height formation of soybean varieties, it was determined that on average in 2019-2020, the studied factors positively affected the growth of soybean plants in height. The lowest height of the soybean plant varieties Monada - 54.0 cm, Madison - 52.1 cm in the budding phase was in the control version (table 2).

Table 2.

Influence of pre-sowing seed treatment on the dynamics of plant height formation of soybean varieties, cm 2019 – 2020

Pre-sowing seed treatment	plant budding phase	flowering phase of plants	phase of filling beans
Monada			
Without processing (control)	54,0	73,1	103,3
Stimpo (25 mg / t)	59,9	81,8	114,0
Rhizolin (2 l / t)	57,8	80,5	110,5
Stimpo(25 mg / t) + Rizoline (2 l / t)	62,3	83,4	117,3
Madison			
Without processing (control)	52,1	74,4	110,5
Stimpo (25 mg / t)	59,0	83,5	123,6
Rhizolin (2 l / t)	56,0	81,0	120,4
Stimpo(25 mg / t) + Rizoline (2 l / t)	60,0	84,6	125,8

The height of plants increased in the Monada variety - by 7.1-15.6% and the Madison variety - by 7.6-15.4% in the variants where the seeds were treated with the bioinoculant Rizoline and the bioregulator of growth Stimpo.

The use of modern preparations for seed treatment provides the best conditions for plant growth. It should be noted that inoculation of seeds with Rhizoline helped to increase the height in Monada - by 7.1% and in Madison - by 7.6%.

The increase in plant height from the use of the drug Stimpo was respectively 15.6%; and 13.5%. When the treatment of seeds with bioinoculant and bioregulator of growth was combined, the growth rates were the highest, amounting to 15.6% in the Monada variety; Madison - by 15.4%. It was found that the most intensive growth of the main stem took place in the period from budding to the beginning of mass flowering, as evidenced by observations of the dynamics of growth and development of plants of the studied soybean varieties. The increase in height during this period in the Monad variety was -11.7-22.7 cm and the medium-early Madison variety -13.5-24.9 cm. up to 83.4 cm and in the Madison variety - from 74.4 to 84.6 cm.

The highest indicator of plant height in soybean varieties was recorded in the phase of filling beans, almost until the end of the growing season the growth of the main stem did not occur. The lowest values of plant height were observed in the control (103.3 cm in the variety Monada and 110.5 cm in the variety Madison).

The best options in the experimental scheme were those where the seeds were treated with the bioregulator of growth Stimpo alone and in combination with the bioinoculant Rizoline. The increments from the combined seed treatment reached 15.3 cm in the Monada variety and 14.0 cm in the Madison variety compared to the untreated varieties. The maximum height of plants was formed in the phase of filling beans with joint treatment of seeds with bioinoculant and bioregulator of growth in the variety Madison - 125.8 cm and in the variety Monada 117.3 cm.

Conclusion. In the study of soybean varieties grown in the experimental field of VNAU, it was found that the treatment of seeds with bioinoculant Rizoline and biostimulator Stimpo had a positive effect on plant survival. The plant survival rate of Monada and Madison was highest (80.8% and 78.6%) in the variants of the experiment where the seeds were treated with Rizoline bioinoculant in combination with Stimpo biostimulator, where the number of plants at harvest was 41.7 and 41.6 pcs / m^2 respectively. Also, in the studied varieties, the maximum plant height was formed in the phase of filling beans with joint treatment of seeds with bioinoculant and bioregulator of growth.

References

1. Didur I.M., Tsyhanskyi V.I., Tsyhanska O.I., Malynka L.V., Butenko A.O., Klochkova T.I. The effect of fertilizer system on soybean productivity in the conditions of right bank forest-steppe. Ukrainian Journal of Ecology, 2019 Vol. 9(1), 76-80.

2. Didur I. M., Tsyhanskyi V. I., Tsyhanska O.I., Malynka L. V., Butenko A. O., Masik I. M., Klochkova T. I. Effect of the cultivation technology elements on the activation of plant microbe symbiosis and the nitrogen transformation processes in alfalfa agrocoenoses. Modern Phytomorphology. 2019. 13: 30–34.

3. Didur I.M., Prokopchuk V.M., Pantsyreva H.V. Investigation of biomorphological and decorative characteristics of ornamental species of the genus Lupinus

L. Ukrainian Journal of Ecology. 2019 Vol. 9 (3). C. 287-290. [in Ukrainian].

4. Kaminskyi, V.F., Mosondz N.P. Vplyv elementiv tekhnolohii vyroshchuvannia na urozhainist soi v umovakh pivnichnoho Lisostepu Ukrainy [Influence of elements of cultivation technology on soybean yield in the conditions of the northern Forest-steppe of Ukraine]. Kormy i kormovyrobnytstvo. 2010. № 66. 91–95. [In Ukrainian].

5. Mazur V.A., Mazur K.V.,Pantsyreva H.V. Influence of the technological aspects growing on quality composition of seed white lupine (Lupinus albus L.) in the Forest Steppe of Ukraine. Ukrainian Journal of Ecology. 2019. Vol. 9. P. 50-55.

6. Palamarchuk V. D., Polishchuk I. S., Mazur O. V., Palamarchuk O. D. Novitni ahrotekhnolohii u roslynnytstvi [The latest agricultural technologies in crop production]. Vinnytsia. VNAU. 2017. 334. [In Ukrainian].

7. Polishchuk I. S. Polishchuk M. I., Mazur O. V. Polova skhozhist nasinnia sortiv soi zalezhno vid strokiv sivby za temperaturnym rezhymom gruntu [Field germination of soybean seeds depending on sowing dates by soil temperature]. Silske hospodarstvo ta lisivnytstvo. 2018. №11. 36–43. [In Ukrainian].

8. Tsyhanska O. I. Vplyv mineralnykh dobryv, peredposivnoi obrobky nasinnia ta pozakorenevoho pidzhyvlennia mikroelementamy na yakisni pokaznyky zerna sortiv soi [Influence of mineral fertilizers, presowing treatment seeds and foliar feeding with microelements on qualitative indicators soybean grains]. Zbirnyk naukovykh prats Vinnytskoho natsionalnoho ahrarnoho universytetu. Silske hospodarstvo ta lisivnytstvo. № 8. Vinnytsia. 2018. S. 78-86. [In Ukrainian]

9. Tsyhanska O. I., Tsyhanskyi V. I. Vplyv systemy udobrennia na prokhodzhennia faz rostu i rozvytku sortiv soi ta na koefitsiient zberezhennia roslyn [Influence of fertilizer system on passing the phases of growth and development of soybean varieties and the conservation rate plants]. Zbirnyk naukovykh prats Vinnytskoho natsionalnoho ahrarnoho universytetu. Silske hospodarstvo ta lisivnytstvo. № 13. Vinnytsia. 2019. S. 119-133. [In Ukrainian]

10. Tsyhanska O.I. Tsyhanskyi V.I. Vplyv mineralnykh dobryv ta sposobiv vykorystannia kompleksu mikroelementiv na vysotu roslyn soi [Influence of mineral fertilizers and ways to use a complex of trace elements at the height of soybean plants]. Zbirnyk naukovykh prats Vinnytskoho natsionalnoho ahrarnoho universytetu. Silske hospodarstvo ta lisivnytstvo. № 15. Vinnytsia. 2019. S. 83-93. [In Ukrainian]

11. Tsyhanskyi V.I., Tsyhanska O.I. Vplyv elementiv tekhnolohii vyroshchuvannia na aktyvizatsiiu roslynno-mikrobnoho symbiozu ta protsesy transformatsii azotu u ahrotsenozakh liutserny posivnoi [Influence of elements of technology cultivation to activate plant-microbial symbiosis and processes transformation of nitrogen in agrocenoses of alfalfa]. Zbirnyk naukovykh prats Vinnytskoho natsionalnoho ahrarnoho universytetu. Silske hospodarstvo ta lisivnytstvo. № 16. Vinnytsia. 2020. S. 61-72. [In Ukrainian]

12. Zabolotnyi H.M., Tsyhanskyi V.I., Tsyhanska O.I. Urozhainist ta enerhetychna efektyvnist vyroshchuvannia soi v umovakh Lisostepu Pravoberezhnoho [Yield and energy efficiency of soybean cultivation in the conditions of the Forest-Steppe of the Right Bank]. Visnyk SNAU. 2015. №9. P. 151–154. [in Ukrainian]

13. Zabolotnyi H.M., Mazur V.A., Tsyhanska O.I,, Didur I.M., Tsyhanskyi V.I., Pantsyreva H.V. (2020). Ahrobiolohichni osnovy vyroshchuvannia soi ta shliakhy maksymalnoi realizatsii yii produktyvnosti: monohrafiia Monohrafiia [Agrobiological bases of soybean cultivation and ways of maximum realization of its productivity]. Vinnytsia: VNAU. [In Ukrainian].

14. Zabolotnyi H. M., Tsyhanskyi V. I. Tsyhanska O. I. Symbiotychna produktyvnist soi zalezhno vid rivnia udobrennia v Pravoberezhnomu Lisostepu [Symbiotic productivity of soybeans depending on the level of fertilizer in the Right Bank Forest-Steppe]. *Natsionalnyi naukovyi tsentr «Instytut zemlerobstva NAAN».* 2015. №1. 46–53. [In Ukrainian].

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