

UDK 635.21: 632.983. 3(477.71)

BARANCHUK Y., candidates of agriculture science

*Bila Tserkva National Agrarian University*

**YIELD OF EARLY POTATO VARIETIES PLANTING TUBERS  
UNDER TREATMENT WITH CHEMICAL MEANS  
IN THE CENTRAL PART OF THE NORTHERN FOREST-STEPPE OF UKRAINE**

Викладено результати досліджень варіювання врожайності та якості насінневої фракції картоплі залежно від обробки садивних бульб препаратами способом дрібнокрапельного нанесення перед садінням (Актара, Матадор Супер, Тирана, Броня, Престиж) і вегетуючих рослин (Конфідор Максі) ранньостиглих сортів в умовах центральної частини Лісостепу України.

Вивчено формування та якісний склад насінневої фракції картоплі ранньостиглих сортів української селекції Подолянка, Повінь, Тірас, Серпанок і Глазурна залежно від обробки садивних бульб протруйниками інсектицидного та інсекто-фунгіцидної дії.

Проаналізовано реакцію генотипу сорту на обробку препаратами.

Рекомендовано на насінневих посадках картоплі для збільшення кількості непошкоджених стандартних насінневих бульб враховувати генотип сорту.

**Ключові слова:** сорт, генотип сорту, препарати, картопля, бульба насіннева, врожайність.

**The problem statement and analysis of recent research and publications.** Potato is fourth ranked – behind wheat, corn and rice in the worldwide production of plant food. Potato is of particularly importance in providing food in our country, being especially valuable and irreplaceable in humans daily nutrition. Therefore, increasing potato production and stabilizing it over the years to meet the population needs, is one of the important problems of modern agriculture.

There are three crucial inextricably interrelated factors in the problem of productivity and stabilizing the production of crops increase, including potatoes, they are genotype varieties - seeds - growing technology and each of them can not be regarded as more or less important.

The national breeding has created a large number of potato varieties that are of high performance in their agronomic traits, group resistance to diseases and pests, suitable for cultivation in different soil - climatic zones of Ukraine [3, 12, 13].

Seed is one of the main factors of food potato growing technology. It carries biological and economic characteristics of sorts. Therefore, the quality of planting tubers (seed) depends largely on the variety level of genotype yield potential implementation. Thus, searching ways to improve the technology of high-quality planting material is an urgent issue in the area of seed potatoes.

Formation of high-yielding properties and qualities of seed potato is achieved through using special measures tubers preparation for planting, care during the growing season, harvesting and post-harvest treatment and storage in the system of potato seed growing.

Besides, the DSTU 4013-2001 requires peculiar size and shape of planting tubers, tubers affected with diseases like wet rot blight, blackleg, dry rot (fomoz, fusarium) and others [16].

Potato crops protecting from diseases and pests is an important link in the seed production technology chain in improving of planting material quality.

To obtain planting tubers of standard sizes thickened planting, the use of large planting tubers, early harvesting, late summer planting, etc. are recommended [1, 2, 3, 5, 9, 10]. However, these measures do not always produce the desired results. Often, depending on weather conditions and the level of farming, planting crops in production have a significant number of deformed and rot damaged tubers. These tubers are usually used for consuming. Therefore, it is important to ensure maximum yield of intact seed tubers fraction during the seed growing [11, 14, 15, 17]. It is impossible to get ones without plant protection products application the range of which is constantly increasing.

Thus, the necessity of conducting research on obtaining maximum yield of standard seed tubers under their treatment with protectants.

The research purpose. To study the changes in the yield of seed potato tubers and its structure under early ripening varieties treatment with protectants in terms of the central part of the Northern Steppes of Ukraine.

The research methodology. Experimental studies were conducted on the experimental field of Bila Tserkva National Agrarian University, whose lands which are located in the Central part of the Northern Steppes of Ukraine.

In 2009-2013 the field experiments on studying the influence of insecticides on the productivity of individual plants and potatoes yield depending on the genotype of the variety was conducted in eight-field rotation of the department of genetics, seed production and breeding. The predecessor was winter wheat.

The soils of the experimental plots were typical black soil humus, of large-scale particles medium loam soil texture. According to the analysis they are characterized with the following indicators: in the plow layer of 0-30 cm humus content is 3, 63 %; N - 7,6 mg P<sub>2</sub>O<sub>5</sub> – 13,9 mg K<sub>2</sub>O - 15.1 mg per 100 g of soil; the sum of absorbed bases – 25,3 mg. equivalent, hydrolytic acidity - 2.15 mg. equivalent per 100 g of absolutely dry soil.

Organic fertilizers (40t/ha) in the form of litter strawy cattle manure containing N<sub>0,40-0,45</sub> P<sub>0,116-0,262</sub> K<sub>0,4-0,6</sub>, were introduced in autumn in course of autumn plowing. Mineral fertilizers - containing NPK nitroammophoska with 16 % of each element of a rate N<sub>90</sub>P<sub>90</sub>K<sub>90</sub> kg/ha of active ingredient were spread in spring before planting potatoes by scattering over the surface of the soil.

The studies were conducted on the elite material of Podolyanka, Povin, Tyras, Serpanok and Glazurna early potato varieties.

Before planting the tubers were treated with protectants by small dropapplying of the following solutions: Aktara - 0.2 kg of the drug per 15 liters of water; Matador Super, Tyran and Bronya - 0.75 l per 15 liters of water, Prestige - one liter of the drug dissolved in 15 l of water and applied on a tonne of potato tubers.

The Konfidor Maxi was applied in plants treatment for growing plants at the rate of 0.05 l/ha and it served as a control.

Potato planting was carried out in accordance with the scheme of the experiment, the tubers were planted in pre-formed crests followed with wrapping and final ridges forming with KFK -2.8 milling cultivator.

The crops care comprised two pre- and two after-sprouting treatment cultivation and bushes hilling before the lines closing.

To protect crops from disease during the growing season of potato Rydomil Gold MTs fungicide at the rate of 2.5kg/ha was applied. The first fungicide treatment was performed in the phase of the tops closing in the lines when plant height is 15 - 20cm. The second treatment was performed in 14 days after the first one, and the third one – in 14 days after the second one.

Agrochemical soil analysis was performed according to the conventional method [8]: humus - by Tyurin, salt extraction Ph – by potentiometric method, hydrolytic acidity – by Kappen, nitrogen - by Keldal, mobile phosphorus - by Kirsanov, Potassium metabolism - on fire photometre by Peive .

The harvest accounting was performed gravimetrically by fields. The yield structure was determined at harvesting and after the treatment period [8].

The obtained data were processed by dispersion analysis for multifactor experiment using the PC software packages Statistica for Windows 5.0. [5, 7].

**Results and discussion.** Seed tubers fraction yield capacity is one of the important indicators producers are concerned in growing potatoes.

On average, the highest yield of seed fraction potato tubers during the research time was obtained under planting tubers treatment with Bronys in Podolyanka (23.9 t/ha) and Glazurna (18.9 t/ha) varieties; with Tyran (21.0 t/ha) and Matador Super in Serpanok variety (8.8 t/ha), and in Tyras variety Konfidor Maxi treatment (8.8 t/ha) in growing plants in a variety (figure 1.).

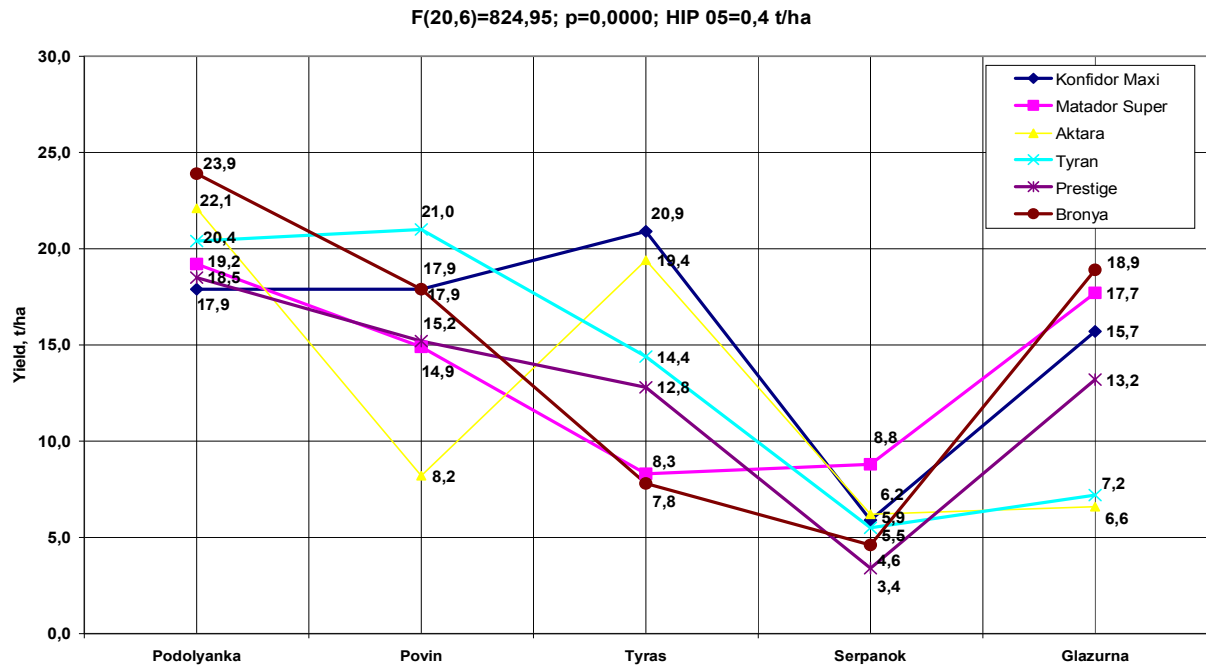


Figure 1. The yield of seed tubers fraction depending on the genotype of the variety and drugs treatment, t/ha.

The main condition of high-productive potato growing is the use of healthy, high-quality planting material with the necessary economic and biological parameters [3, 4]. Thus, it is not enough to get a seed fraction yield of potato tubers. One needs to know its qualitative composition.

In the course of analyzing the structure of the seed tubers fraction yield in Podolyanka variety (figure 2) we have found that under treatment the growing plants with Konfidor Maxi standard (intact) seed tubers output was 46.1 %, standard (with signs of rot) - 44.3% and distorted - 9.6% of the yield nearly the same standard (intact) seed tubers quantity (45.5 %) was obtained under planting tubers treatment with Bronya, however, the percent of standard (with signs of rot) increased by 10.2 % and no distorted tubers were found. The standard (intact) tubers output in planting tubers treatment with Konfidor Maxi was significantly reduced versus treatment growing plants of Podolyanka variety with Aktara and Prestige and was 23.9 and 31.3 %, and standard tubers percent (with signs of rot) up to 74.9 and 68.7 %, respectively, while the number of distorted was 1.2 and 0.0 %. Under treatment with Matador Super and Tirana standard (intact) tubers output increased to 59.0 and 76.8 %, standard output (with signs of rot) reduced to 39.8 and 23.2%, the percentage of distorted tubers was 1.2 and 0.0 %, respectively.

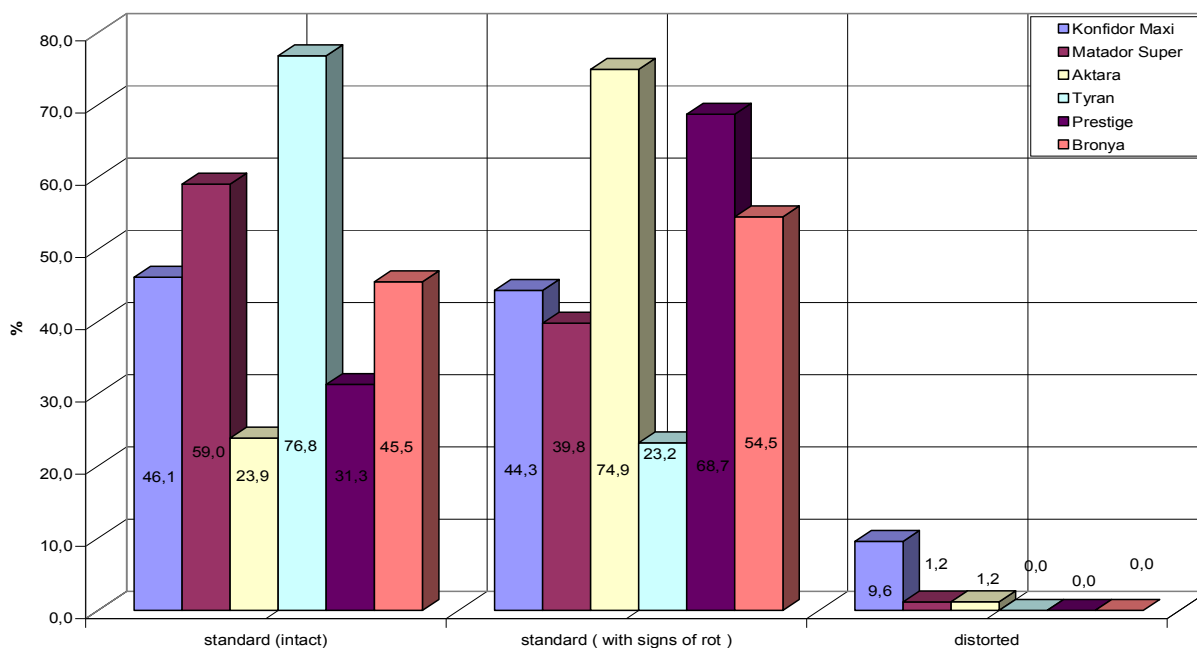


Figure 2. Yields structure of Podolyanka variety seed fraction grade tubers, depending on treatment with various preparates, %.

Thus, in Podolyanka variety the highest yield of standard (intact) seed tubers was obtained under planting tubers treatment with Tirana (76.8 %).

As for the structure of the seed fraction yield in Povin variety (figure 3.) there has been found out that under growing plants treatment with Konfidor Maxi standard (intact) seed tubers output was 67.5 %, standard (with signs of rot) 27.0 % and distorted ones made 5.5 %, similar to the standard (intact) seed tubers (60.7 %) output was obtained under planting tubers treatment with Prestige. However, the percent of standard (with signs of rot) increased by 9.2 % and distorted tubers number decreased by 2.4%. Standard (intact) tubers output significantly reduced versus Povin variety growing plants treatment with Konfidor Maxi under planting tubers treatment with Aktara, Super Matador, Bronya and Tirana and was 56.2, 53.3, 49.5 and 49.4 % and standard (with signs of rot) tubers percent up to 37.9, 31.7, 25.9 and 46.2 %, respectively, while the number of distorted ones was 5.9, 15.0, 24.6, and 4.4 %.

Nearly the same percentage of the standard (intact) tubers is formed under the treatment with Bronya and Tirana but the standard (with signs of rot) ones output was 20.3 %, lower and the distorted tubers made 20.2 % more than under Tirana treatment.

Thus, Povin variety gave the highest yield of standard (intact) seed tubers obtained under planting tubers treatment with Prestige (60.7 %) and growing plants treatment with Konfidor Maxi (62.5 %).

In Tiras variety the amount of standard (intact) seed tubers output was 76.0 %, standard (with signs of rot) - 21.2 % and 2.8% of distorted ones under growing potato plants treatment with Konfidor Maxi (figure 4.). Rather close amount of standard (intact) seed tubers output (79.3 and 78.9 %) was obtained under planting tubers treatment with Aktara and Tyran but under by the tubers treatment with Aktara the percentage of the standard (with signs of rot) was by 8.0 % lower and the amount of distorted tubers increased by 4.6 % and under tubers treatment with Tyran the number of standard rate (with signs of rot) tubers is almost the same (21.1 %), and no distorted tubers were observed. The standard (intact) tubers output was 13.9, 23.0 and 23.9 % lower compared with growing plants of Tyras variety treatment with Konfidor Maxi under planting tubers treatment with Prestige, Matador, Super and Bronya, and the percentage of the standard (with signs of rot) increases to 30.1, 30.7 and 46.3 %, respectively, while the number of distorted ones was 7.3, 16.4 and 2.6 %.

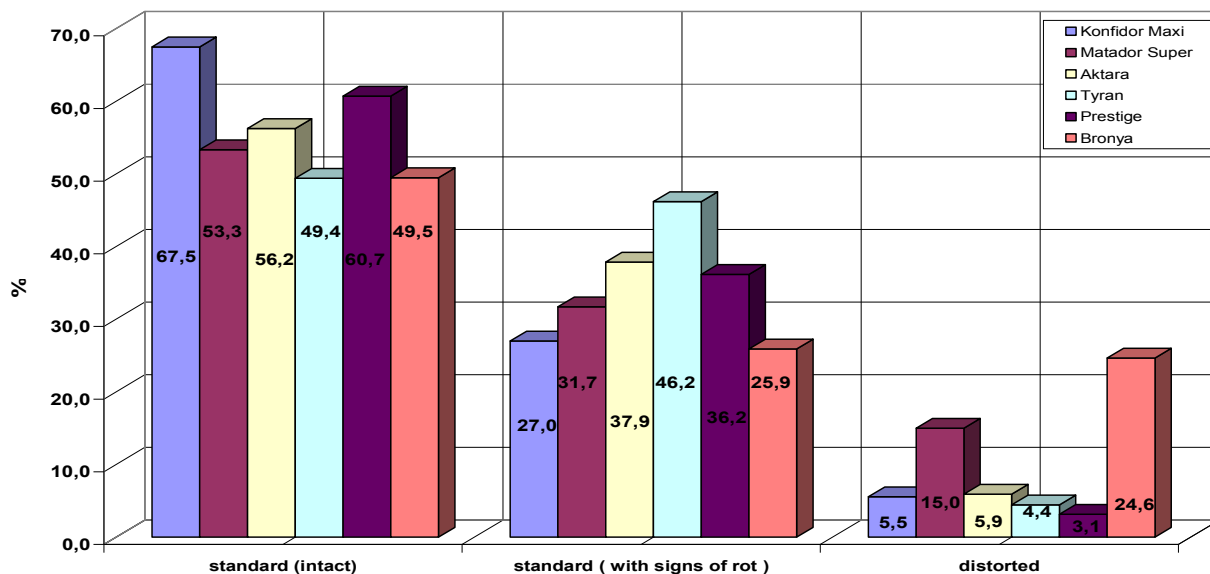


Figure 3. Yields structure of Povin variety seed fraction grade tubers, depending on treatment with various prepartes, %.

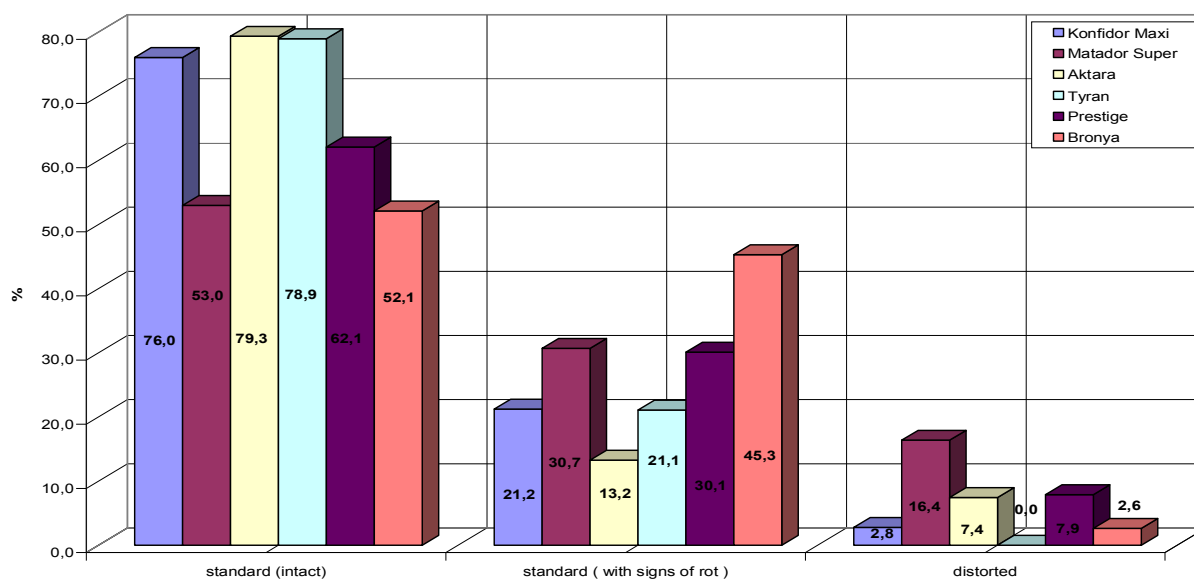


Figure 4. Yields structure of Tyras variety seed fraction grade tubers, depending on treatment with various prepartes, %.

Thus, in Tyras variety the highest yield of standard (intact) seed tubers obtained under planting tubers treatment with Tyran (78.9 %) and Aktara (79.3 %) and under treatment of growing plants with Konfidor Maxi (76.0 %).

In Serpanok variety under growing plants treatment with Konfidor Maxi the amount of standard (intact) seed tubers output was 79.4 %, standard ones (with signs of decay) - 14.4 % and distorted ones was 6.2% (figure 5 ). A close amount of standard (intact) seed tubers output (76.1%) was received under planting tubers treatment with Tyran, however, the there was a reduced the percentage of standard (with signs of rot) tubers by 4.0 % and increased number in distorted ones by 7.2%. Significantly reduced standard (intact) tubers output versus Serpanok variety growing plants treatment with Konfidor Maxi in planting tubers treatment with Matador Super, Bronya, Prestige, Aktara , and makes 55.6, 55.4, 41.1 and 29.1 % and the percentage of standard (with signs of rot) ones increases to 42.1, 37.9, 58.9 and 29.1%, while the number of distorted ones was 2.3, 6.7, 0.0 and 41.7 %, respectively.

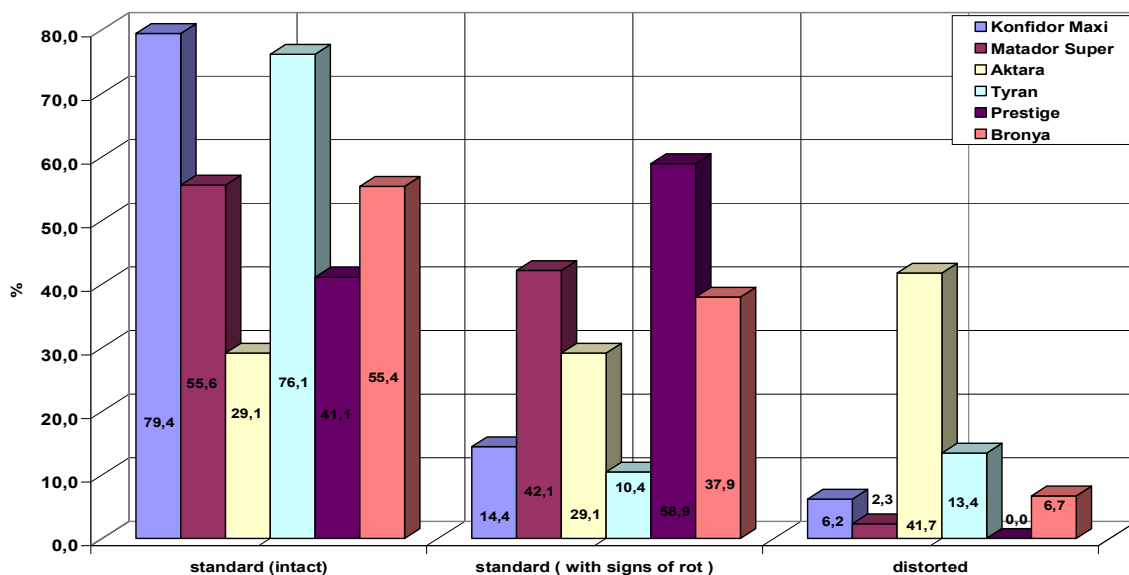


Figure 5. Yields structure of Serpanok variety seed fraction grade tubers, depending on treatment with various preparates, %.

In Serpanok variety the highest yield of standard (intact) seed tubers obtained under planting tubers treatment with Tyran (76.1 %) and under of growing plants treatment with Konfidor Maxi (79.4 %).

Under of Glazurna variety growing potato plants treatment with Konfidor Maxi standard (intact) seed tubers output was 34.5 %, standard (with signs of rot) tubers - 65.6 % and no distorted ones (figure 6). Significantly higher yield of standard (intact) seed tubers ( 78.8 , 59.4 and 41.7%) was received under planting tubers treatment with Bronyya, Tyran and Matador Super. Decrease in the percentage of standard (with signs of rot) tubers - 15.7, 18.4 and 41.1% was observed, but under tubers treatment with these preparates the percentage of distorted tubers increases by 5.4 , 22.2 and 17.2 % respectively compared to the growing plants treatment with Konfidor Maxi. A reduced output of standard (intact) tubers by 15.7 and 15.2 % compared to growing plants treatment with Konfidor Maxi in Glazurna variety under the treatment of planting tubers with Aktara and Prestige and was 18.8 and 19.3 %, respectively, the percentage of standard (with signs of rot) tubers increased to 78.1 and 69.6% and the number of distorted ones increased to 3.1 and 10.9 %.

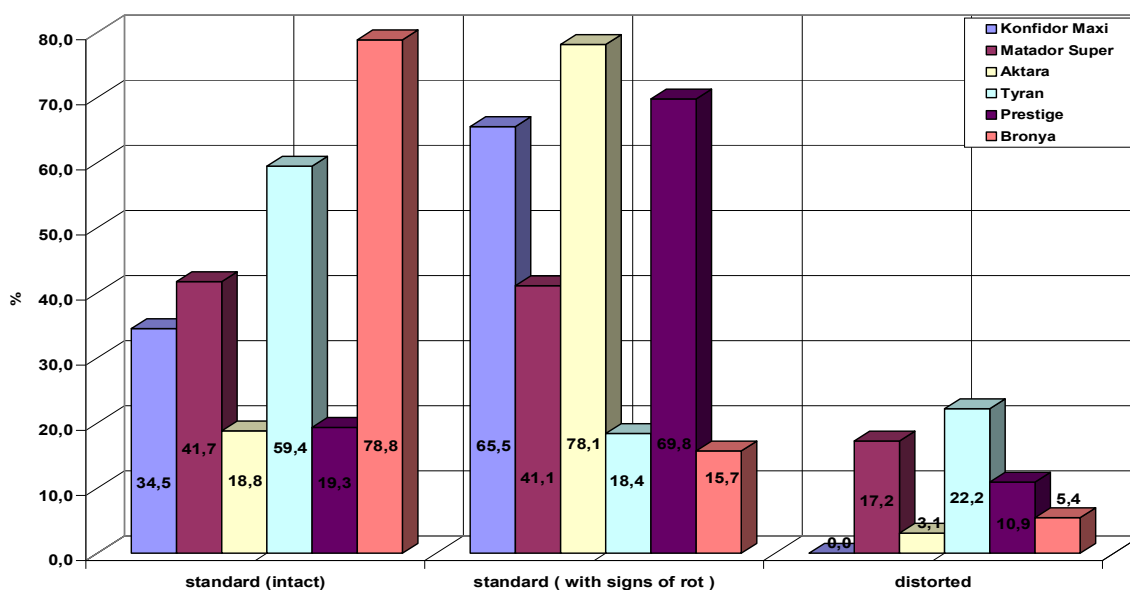


Figure 6. Yields structure of Glazurna variety seed fraction grade tubers, depending on treatment with various preparates, %.

Thus, the highest yield in standard (intact) seed tubers in Glazurna variety was obtained undet planting tubers treatment with Bronya (78.8%).

**Conclusions and recommendations for further research.** In order to increase the standard output (intact) in seed tubers seed potato crops in is necessary to use the preparates considering the genotype of the variety.

In potato seed growing the main indicator is the standard output (intact) seed tubers per unit area, so increasing this share considering the genotype of the variety as well as soil and climatic conditions is the prospect of our future research.

#### СПИСОК ЛІТЕРАТУРИ

1. Баранчук Ю.В. Вплив маси садивних бульб, площ та рівнів живлення на ріст і розвиток картоплі / Ю.В. Баранчук, М.Я. Молоцький // Картоплярство. – 2000. – Вип. 30. – С. 94-102.
2. Баранчук Ю.В. Вплив маси садивних бульб, площ та рівнів живлення на структуру врожаю картоплі / Ю.В. Баранчук, М.Я. Молоцький // Вісник Білоцерківського державного аграрного університету: Зб.наук. праць. – Біла Церква, 2001. – Вип. 15. – С. 15-22.
3. Бондарчук А.А. Контроль якості насіннєвої картоплі / А.А.Бондарчук, В.Я.Починок//Насінництво. – 2008. – №3 – С. 23-26.
4. Бондарчук А.А. Наукові основи насінництва картоплі в Україні: Монографія / А.А. Бондарчук. – Біла Церква, 2010. – 400 с.
5. Державний реєстр сортів рослин придатних для поширення в Україні у 2013 році. – Київ, 2013. – С.224-232.
6. Доспехов Б.А. Методика полевого опыта / Доспехов Б.А. – М.: Агрпромиздат, 1985. – С. 248–301.
7. Картопля / За ред. В.В. Кононученка, М.Я. Молоцького. – Біла Церква, 2002. – Т. 1. – С.199-354.
8. Комп'ютерні методи в сільському господарстві та біології: [Навчальний посібник] / О.М.Царенко, Ю.А. Злобін, В.Г. Скляр, С.М. Панченко. – Суми: Університетська книга, 2000. – 203 с.
9. Куценко В.С. Картопля. Хвороби і шкідники / За ред. В.В. Кононученка, М.Я. Молоцького. – К., 2003. – Т. 2. – 240 с.
10. Литовченко М.С. Вплив густоти садіння на врожай і якість картоплі / Литовченко М.С., Христю І.І. // Картоплярство. – Вип. 20. – К.: Урожай, 1989. – С. 48-49.
11. Методичні рекомендації щодо проведення досліджень з картоплею. – Немішаєве: УААН, Інститут картоплярства, 2002. – 182 с.
12. Молоцький М.Я. Вплив маси садивних бульб і кількості стебел у куці на продуктивність картоплі / Молоцький М.Я., Разкевич М.П. // Вісник с.-г. наук. – М., 1983. – №9. – С.29-30.
13. Осипчук А.А. Особливості сортів картоплі Інституту картоплярства НААНУ/А.А.Осипчук // Посібник українського хлібороба, 2010. – С.296-297.
14. Погорілий С.О. Технологія вирощування картоплі в Лісостепу України: Монографія / С.О. Погорілий, М.Я. Молоцький. – Біла Церква: БДАУ, 2007. – 164 с.
15. Сортові та посівні якості картоплі насіннєвої. Технічні умови: ДСТУ 4013 – 2001. – [Чинний від 2002-01-01]. – К.: Держспоживстандарт України, 2001. – 12 с. (Національний стандарт України).
16. Теслюк П.С. Насінництво картоплі / П.С.Теслюк, М.Я. Молоцький, М.Ю. Власенко. – Біла Церква, 2000. – 200 с.
17. Шпаар Дитер. Выращивание картофеля / Дитер Шпаар, Петер Шуманн. – М., 1997. –234 с.

#### REFERENCES

1. Baranchuk Ju.V. Vplyv masy sadyvnyh bul'b, ploshh ta rivniv zhyvlennja na rist i rozvytok kartopli (Effect of planting tubers mass, space and power levels on potato growth and development), Ju.V. Baranchuk, M.Ja. Moloc'kyj, *Kartopljарstvo*, 2000, Vyp. 30, pp. 94-102.
2. Baranchuk Ju.V. Vplyv masy sadyvnyh bul'b, ploshh ta rivniv zhyvlennja na strukturu vrozhajju kartopli (Influence of planting potato tuber, areas and nutrition levels on potato yield structure), Ju.V. Baranchuk, M.Ja. Moloc'kyj, *Visnyk Bilocerkivs'kogo derzhavnogo agrarnogo universytetu: Zb.nauk. prac'*, Bila Cerkva, 2001, Vyp. 15, pp. 15-22.
3. Bondarchuk A.A. Kontrol' jakosti nasinnjevoi' kartopli (Seed Quality Control), A.A.Bondarchuk, V.Ja.Pochynok, *Seed growing*, 2008, No. 3, pp. 23-26.
4. Bondarchuk A.A. Naukovi osnovy nasinnyctva kartopli v Ukraїni (Scientific basis of seed potatoes growing in Ukraine: Monograph), Bila Cerkva, 2010, 400 p.
5. Derzhavnyj rejestr sortiv roslin prydatnyh dlja poshyrennja v Ukraїni u 2013 roci (National register of plant varieties available for distribution in Ukraine in 2013), Kyї'v, 2013, pp. 224-232.
6. Dosphehov B.A. Metodyka polevogo opyta (Field experience methods), Dosphehov B.A., M.: Agropromyzdat, 1985, pp. 248–301.
7. Kartoplja, (Potato), Za red. V.V. Kononuchenka, M.Ja. Moloc'kogo, Bila Cerkva, 2002, T.1., pp.199-354.
8. Komp'juterni metody v sil'skomu gospodarstvi ta biologii': [Navchal'nyj posibnyk], (Computer methods in agriculture and biology [tutorial]), O.M.Carenko, Ju.A. Zlobin, V.G. Skljар, S.M. Panchenko, Sumy: Universytetska knyga, 2000, 203 p.
9. Kucenko V.S. Kartoplja. Hvoroby i shkidnyky (Potato. Diseases and pests), Za red. V.V. Kononuchenka, M.Ja. Moloc'kogo, K., 2003, T. 2., 240 p.
10. Lytovchenko M.S. Vplyv gustoty sadinnja na vrozhaj i jakist' kartopli (Effect of planting density on yield and quality of potato), Lytovchenko M.S., Hrystju I.I., *Kartopljарstvo*, Vyp. 20, K.: Urozhaj, 1989, pp. 48-49.
11. Методичні рекомендації shhodo provedennja doslidzhen' z kartopleju (Guidelines for conducting research on potato), Nemishajeve: UAAN, Instytut kartopljарstva, 2002, 182 p.
12. Moloc'kyj M.Ja. Vplyv masy sadyvnyh bul'b i kil'kosti stebel u kushhi na produktyvnist' kartopli (Effect of mass planting tubers and number of stems in the bush on the potato yield), Moloc'kyj M.Ja., Razkevych M.P., *Visnyk s.-g. nauk*, M., 1983, No. 9, pp. 29-30.
13. Osypchuk A.A. Osoblyvosti sortiv kartopli Instytutu kartopljарstva NAANU (Features of potato varieties of Institute of potato growing of UAAS), A.A.Osypchuk, *Posibnyk ukrai'ns'kogo hliboroba*, 2010, pp. 296-297.

14. Pogorilyj S.O. Tehnologija vyroshhuvannja kartopli v Lisostepu Ukrai'ny: Monografija (Potato growing technology in the Lisosteppe of Ukraine: Monograph), S.O. Pogorilyj, M.Ja. Moloc'kyj, Bila Cerkva: BDAU, 2007, 164 p.

15. Sortovi ta posivni jakosti kartopli nasinnjevoi'. Tehnichni umovy: DSTU 4013 (Seed potato varieties and crop quality. specifications: DSTU 4013), 2001, [Chynnyj vid 2002-01-01], K.: Derzhspozhyvstandart Ukrai'ny, 2001, 12 p. (Nacional'nyj standart Ukrai'ny).

16. Tesljuk P.S. Nasinnyctvo kartopli (Potato seed breeding), P.S. Tesljuk, M.Ja. Moloc'kyj, M.Ju. Vlasenko, Bila Cerkva, 2000, 200 p.

17. Shpaar Dyter. Vyrashhyvanye kartofelja (Potato growing), Dyter Shpaar, Peter Shumann, M., 1997, 234 p.

#### **Выход посадочных клубней картофеля в зависимости от генотипа сорта и обработки протравителями в Лесостепи Украины**

**Ю.В. Баранчук**

Изложены результаты исследований варьирования урожайности и качества семенной фракции картофеля в зависимости от обработки посадочных клубней препаратами способом мелкокапельного нанесения перед посадкой (Актара, Матадор Супер, Тирана, Броня, Престиж) и вегетирующих растений (Конфидор Макси) раннеспелых сортов в условиях центральной части Лесостепи Украины.

Изучены формирование и качественный состав семенной фракции картофеля раннеспелых сортов украинской селекции Подолянка, Повинь, Тирас, Серпанок и Глазурна в зависимости от обработки посадочных клубней протравителями инсектицидного и инсекто-фунгицидного действия.

Проанализирована реакция генотипа сорта на обработку препаратами.

Рекомендовано на семенных посадках картофеля для увеличения количества неповреждённых стандартных семенных клубней учитывать генотип сорта.

**Ключевые слова:** сорт, генотип сорта, препараты, картофель, клубень семенной, урожайность.

*Надійшла 26.03.2014 р.*