

**UDC 631.356.22**

**V.A. Boyko, graduate student**

Ternopil Ivan Puluj National Technical University, Ukraine

## **THE RESULTS OF EXPERIMENTAL RESEARCH OF ROOT CROPS HAULM HARVESTING**

The further intensification of the modern development of agricultural production is possible based on the mechanization of all of production processes. It can be achieved by ensuring of development and implementation modern highly efficient harvesting technologies of products of crops, including and roots.

One of the most time-consuming operations in the technological process of production of root crops is harvesting of haulm.

Modern directions of development of single-phase self-propelled bunker machines for cleaning root crops anticipates modular principle of their construction.

The first stage of single-phase harvesting technology of root crops is a two-step method of picking haulm. It's harvesting of main body of haulm by rotary haulm cutter with the following cutting of residues of haulm by cutter heads root crops like "passive knife-passive copier" [1, 2].

The problem of increase of technical level of haulm harvesting modules remains the particularly relevant in the terms of further development of root crop machinery. The main criteria for evaluation of modules is the quality indicators of cutting tops.

Therefore developing and improvement of structural-layout schemes of machines (modules) and justification of parameters of their working bodies should be carried out taking into account the specific features of the process.

This is especially important and actual in terms of providing the necessary quality indicators in accordance with the requirements.

The cutter of heads root crops (like "passive knife-passive copier") not ensure of required quality indicators of cutting.

The number of partially pulled out from the soil root crops during the contact interaction of the copier, knife and a heads of root crops exceeds 1.5% [3, 4].

For decrease the number of partially pulled out root crops by copier and a knife we proposed an improved construction of cutter heads of root crops.

Were carried out comparative experimental studies on the field to determine of technological efficiency of using construction of improved cutter that is installed on machine for harvesting haulm.

It was investigated in three ways:

- a serial cutter of heads root crops (firms «Kleine», «Moreau», «Tim» and etc.);
- cutter of heads root crops which has a spring-loaded knife and cutter of heads root crops which has a spring-loaded knife and copier is installed on shock absorber in the form of an elastic plate.

Variable factors of two-factor experiment were accepted:

- speed of machine (vehicle) 1.2...1.8 m / s;
- the height of the root crops in relation to ground level 3...9 c.

The regression equations which received after processing of general sample of the experiments are received. They describe the dependence of the number of partially pulled out from the soil root crops for three types of cutter heads root crops:

- of the number of root crops as a percentage (the sample size was 100 units):

$$B_{1k} = -12,64 + 34,17V_M - 12,47h_k + 3,75V_M h_k - 10,42V_M^2 + 0,98h_k^2; \quad (1)$$

$$B_{2k} = 10,26 + 10,83V_M - 12,78h_k + 4,17V_M h_k - 5,21V_M^2 + 0,8h_k^2; \quad (2)$$

$$B_{3k} = 57,93 - 36,7V_M - 15,03h_k + 3,75V_Mh_k + 7,29V_M^2 + 1,2h_k^2; \quad (3)$$

- of the total mass of root crops as a percentage (the sample size was 100 units):

$$B_{1m} = -0,13 + 2,92V_M - 1,63h_k + 0,54V_Mh_k - 1,04V_M^2 + 0,12h_k^2; \quad (4)$$

$$B_{2m} = 2,33 + 0,25V_M - 1,6h_k + 0,5V_Mh_k - 0,31V_M^2 + 0,1h_k^2; \quad (5)$$

$$B_{3m} = 5,83 - 3,67V_M - 1,6h_k + 0,42V_Mh_k + 0,73V_M^2 + 0,11h_k^2; \quad (6)$$

According to the obtained regression equations (1)-(6) is constructed response surface (Fig. 1, 2). These equations describe the dependence of the change the number of partially pulled out root crops from the soil by working bodies of machine for harvesting haulm as a functional of  $B_i = f(V_M; h_k)$ .

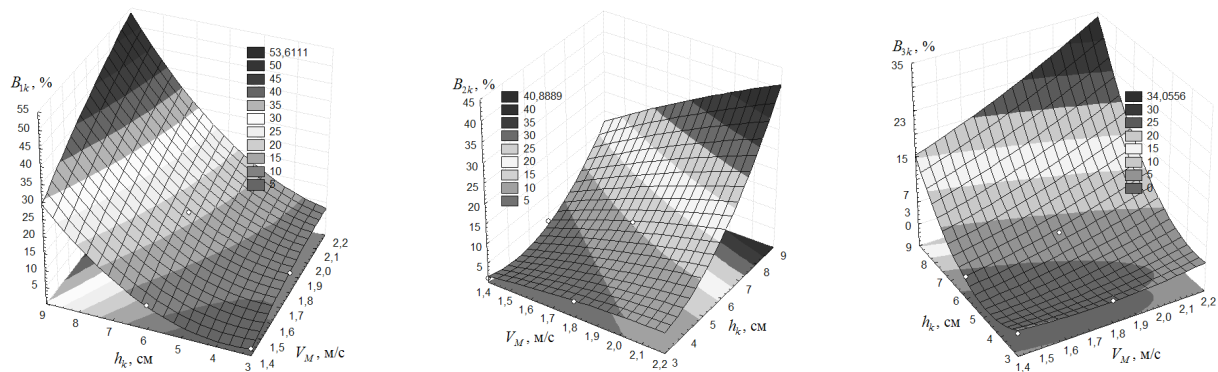


Fig. 1 – The response surface as a functional of  $B_{ik} = f(V_M; h_k)$

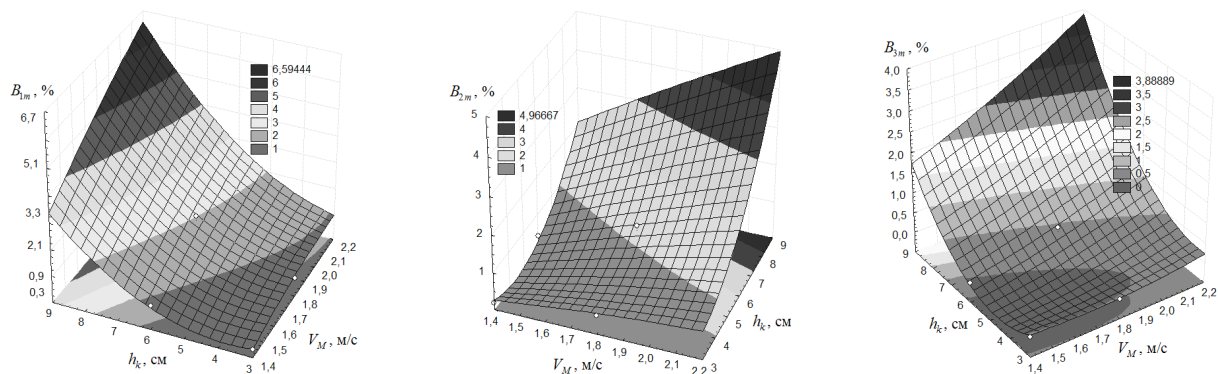


Fig. 2 – The response surface as a functional of  $B_{im} = f(V_M; h_k)$

## References

1. Войтюк Д.Г., Барановський В.М. та ін. Сільськогосподарські машини. Основи теорії та розрахунку: Підручник ; за ред. Д.Г. Войтюка. К.: Вища освіта, 2005. 464 с.
2. Барановський В.М., Підгурський М.І., Паньків М.Р., Теслюк В.В., Онищенко В.Б. Основи розробки адаптованих транспортно-технологічних систем коренезбиральних машин : монографія. Вид. Тернопільського національного технічного університету імені Івана Пулюя. Тернопіль: ТНТУ ім. І. Пулюя, 2014. 351 с.
3. Baranovsky V. Dubchak N. Pankiv M. Experimental research of stripping the leaves from root crops. Acta technologica agriculturae. 2017. Vol. 20. Part 3. P. 69 – 73.
4. Барановський В.М., Рамш В.Ю. Оптимізаційні математичні моделі процесу викопування вороху коренеплодів пасивним сферичним диском. Вісник Львівського національного аграрного університету: агроінженерні дослідження. 2002. № 12(2). С. 337 – 349.