

## **Reaction of seed sowing technique on maize growth and operational and economic indicators of grain collection**

### **Abstract**

The research concentrated technological operations of sowing and harvesting maize grown for grain. The research problem constituted two issues: determining the impact of plant varieties, herbicide treatment time and weed infestation on the yield of maize grown for grain. The research problem also concerned the definition about determining to what extent the technical and technological parameters of tractors and machines affect the operational and economic indicators of the techniques used corn harvesting technology.

The working hypothesis was the assumption that there is a close relationship between the applied maize variety, herbicide treatment, weed infestation and the yield of maize grown for grain. The hypothesis was also the assumption of a significant impact of the used machines for the technological operation of maize grain harvest on the value of operation and economic indicators of the operation.

The tests consisted of two parts, namely laboratory and field tests (field experiments assumed by the split-blok-split-plot method, as three-factor tests) and exploitation tests (concerning maize grain harvest). Laboratory and field tests consisted of three maize varieties (YS Gibuti, Opoka, Smolitop), two dates of herbicidal treatment, weed infestation. Operational tests of corn maize harvest included three types of machines (single-row Tornado 40 EOL tractor, double-row Tornado 80 and Claas Leksion 480 harvester with six-row Dominoni hedge). The following sets of machines were used for corn harvesting technology: A - Ursus C 360 + Tornado 40 EOL, Ursus C 360 + Ursus T-610 (6 tonnes), B - Ursus C 392 + Tornado 80, Ursus C 392 + Ursus T-670 -A1 (10 tons), C - Claas Lexion 480, Ursus C 392 + Ursus T-670-A1 (10 tons).

On the basis of laboratory and field tests it was found that with the increase of weed infestation, the percentage of grain in the flask decreases, delayed application of herbicides causes weaker initial plant development, resulting in lower plant height before harvest, smaller blade diameter and a high share of non-production flasks, which reflects the yield and

grain moisture, delay in weed control delays significantly the development of plants and the maturation of maize grains by about two weeks. Experience has shown the need to apply herbicides immediately after sowing, since the use of herbicides in the 4-6 leaf phase causes a grain yield decrease of about  $3 \text{ t} \cdot \text{ha}^{-1}$ , while in the 8-10 leaf phase the yield drop was about twice as high and amounted to  $4.5$  up to  $6 \text{ t} \cdot \text{ha}^{-1}$ .

Operational tests included: single-row, double-row and harvester aggregates with a six-row adapter. Under the assumptions of the work organization, the values of the following economy-exploitation indicators were determined for sets: energy expenditure, unit and hourly costs of maize grain harvesting, indicators of technical and technological progress. The energy expenditures were significantly lower for tractor machines ( $175$  and  $133 \text{ MJ} \cdot \text{ha}^{-1}$ ) compared to the combine harvest ( $276 \text{ MJ} \cdot \text{ha}^{-1}$ ). Unit harvesting costs were significantly lower for tractor machines ( $\text{PLN } 194$  and  $\text{PLN } 166 \cdot \text{ha}^{-1}$ ) compared to the combine harvest ( $\text{PLN } 247 \cdot \text{ha}^{-1}$ ). The technical progress index assumed values from the range of  $2.65$ - $11.88 \text{ ha} \cdot 1000\text{PLN}^{-1}$  (harvest) and  $87.45$ - $185,59 \text{ ha} \cdot 1000\text{PLN}^{-1}$  (transport). Smaller values of this indicator concern the set of tractor machines, the larger combine harvest. The highest value of the technological progress indicator is characteristic of the Claas Leksion 480 C combine ( $97.65\%$ ), smaller tractor group machines ( $79.17\%$  and  $75.27\%$ ).

Computational assessments were made in the study. The evaluations were made in the study and statistical assessments of the impact of basic factors on indicators such as: yielding of plants, energy consumption and costs of technological treatments, in the cultivation of maize for grain. The explanation that the effect of weed infestation on crop yielding can be characterized by a linear relationship (corn varieties SY Gibuti and Smolito) or a nonlinear relationship, i.e. a second degree polynomial (Opoka maize variety), should be considered significant.

The selection of machines for harvesting maize should be carried out taking into account the size of the plantation (harvest in the agro technical period), financial possibilities of farms (purchase of modern equipment), hourly and unit cost of harvesting. The conducted scope of research allowed to broaden the knowledge in this field and to obtain additional information about the scientific and utilitarian value enabling formulation of recommendations for agricultural practice.

Research topics concerning agrotechnics cultivation for grain maize, selection of varieties for soil and climatic conditions as well as selection of machines and assessment of their impact on the natural environment are still current.