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Influence of application of plant growth regulators and desiccants on a yield and quality of winter oilseed rape**

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A b s t r a c t. The purpose of the conducted researches was an estimation of influencing of application of growth regulators (metconazole, di-1-P-menten, dimethipin) and desiccants (diquat, glyphosate) on a yield and quality of mass of 1000 seeds (MTS). Influencing of fertilization method of rape is taken into account at the same time. The obtained results specify that the delay of harvest of rape (term I – full maturity, term II – 10 days after) has a substantial influence on the yield of seeds. Losses from that delay can account for as much as 10.9 q ha^{-1}. Application of Caramba (especially in the variant of B and C) had a substantial influence on the yield growth (about 5-6 q ha^{-1}) at collections in the term I, and even stronger in the term II (6-7 q ha^{-1}). The applied regulators of ripening (especially Reglone and Roundup) had a negative influence on the yield growth, causing its decrease of about 2-3 q ha^{-1} (Reglone alone applied in the II term of harvest had a very slight impact on the yield growth). Applied chemicals modified MTS only in an insignificant way (statistically unimportant). Substantial differences were found only between control and combination where Roundup was applied – but only in the term II of harvest. The meaningful decrease of MTS was also found on the combination where Reglone was applied. However, they were statistically insignificant.

K e y w o r d s: oilseed rape, varieties, plant growth regulators, yield, quality

INTRODUCTION

The rape variety of high economic value and simultaneously desirable reaction on the certain agricultural conditions make a substantial part of the plant production technology, and also important factor influencing a yield and quality of crop. The proper selection of the rape variety to be grown in large farms is one of the most important factors impacting on planning and work organization during nurturing and harvesting and also on quality of crop. The selection of variety as a crop yield factor plays a significant role. A variety becomes a more substantial factor which guarantees the high harvests and the high quality of seeds each time. Newly accrued varieties of seeds demonstrate certain new high-quality changes which have higher potential of the productivity and increased nutrient-demand in comparison to the already existing ones. At the same time the new varieties are less susceptible to the losses of harvest which are caused by physiological and by pathogenic factors. All known varieties of the winter oilseed rape prove to be well adapted to very intensive cultivation. It means that they have a very high productivity potential but also higher demand for proper agricultural practice. Possibility of high yield depends on a proper agriculture practice in which an important factor is the right application of insecticides and fungicides. In addition, the use of regulators of growth and ripening of plants decreases the losses of harvest.

The physico-chemical properties of seeds decides about a technological fitness and feeding of varieties, especially such basic components, as dry mass, protein, fat, saccharides, maintenance of in nutritious parts, and also firmness of varieties. Chemical composition of dry mass of varieties is expressly related to their high-quality belonging and depends foremost on genetic factors.

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Two major components of rape varieties are protein and fat and they make 55-70% of complete mass. Double improved varieties consist near 40-45% fat and 24-27% protein and their amount is related also to seed size (Mińkowski and Krygier, 1998).

Increasing requirements for all of rape products are reason to the search of raw material with high quality (Tańska and Rotkiewicz, 2003).

The varieties of rape about a large economic cost and simultaneously desirable reaction on certain agricultural-natural terms make the substantial element of technology of vegetable products and important factor, forming majority and also quality of harvest (Wałkowski *et al*., 2006).

Selection of the group of varieties in the large-scale farm is the most important problem, which influences on harvest stabilization, limitation of the work during care, protection during the oilseed rape rapeseed harvest and on quality of yield. A role of varieties as a factor of harvest is also very important (Heiman, 2005; Muśnicki, 2005; Muśnicki *et al*., 1999).

The possibility of high harvest determines by applying agrochemicals, in which pests and diseases control is very important. Decreasing of harvest losses depends also on applying growth and maturation regulators.

The purpose of the conducted researches was an estimation of influencing of application of growth regulators (metconazole, di-1-P-menten, dimethipin) and desiccants (diquat, glyphosate) on a yield and quality of seeds. Influencing of fertilization method of rape is taken into account at the same time.

MATERIALS AND METHODS

Investigations were conducted at the Experimental Station for Variety Testing in Głębokie (province Kujawsko-Pomorskie, Poland) on 3 varieties of winter oilseed rape, namely Kaszub, Californium, Lisek during 2004-2006 years. Experiment was performed at 4 replications. Plot area for each variety (11 x 1.5 m) at the time of vegetation period was treated by chemicals. For improvement of characteristics of pods before cracking process, di-1-P-menten (Spodnam 555 SC – 0.6 l ha^{-1}) was used and as desiccant diquat (Reglone 200 SL – 2.5 l ha^{-1}) and glyphosate (Roundup 360 SL – 1 l ha^{-1}) were applied. Also, for all varieties introducing of fertilizers (Photrel 6 kg ha^{-1}, Bortrac 1.5 l ha^{-1}, Plonvit R 2 l ha^{-1}) was applied. In the investigation growth regulators metconazole (Caramba 60 SL) and dimethipin (Harvade 250 SC) were also used Caramba 60 SL was used in three variants: A – only in autumn at rate 0.7 l ha^{-1}, B – in autumn and spring at rate 0.7 l ha^{-1}, C – in autumn and spring at rate 1 l ha^{-1}. Harvade 250 SC was used at rate 1.5 l ha^{-1}. Gathering of the harvest was conducted at the phase of full maturity (term I) and 10 days after (term II). The mass of 1000 seeds (MTS) was defined according to the regulations at the seeds water content equal to 7%.

RESULTS AND DISSCUSION

Oilseed rape is plant so much reactive on the improper term of harvesting due to easy cracking of pods leading to losses of seeds. In our investigations the terms of harvesting was chosen to create provocative conditions which promoted seeds losses and to have the possibility of evaluation of examined chemicals applied for improvement of harvest and prevent yield losses. Then oilseed rape was harvested at two terms (Fig. 1). The mean yield of seeds from check plots was 52.5 q ha^{-1}. This value was employed in comparison the yields obtained from other treatments. Application of Caramba 60 SL increased yield of seeds. Depending on a variant of application (A, B, C) an increase was: 0.4, 4.7, and 5.5 q ha^{-1}, respectively. The most profitable variant was application of Caramba 60 SL at rate 1 l ha^{-1} in autumn and in spring. Influence of other examined agrochemicals on the yield of oilseed rape was negative. Fertilization – diminishing of yield about 0.8 q ha^{-1}, Spodnam 555 SC – 1.3, Harvade 250 SC – 1.7, Reglone 200 SL – 2.3, and Roundup 360 SL – 3 q ha^{-1}. Delay the term of harvest (10 days after full maturity) promoted the losses of seeds and the yield from check plots was about 20% lower compared with yield collected at stage of full maturity.

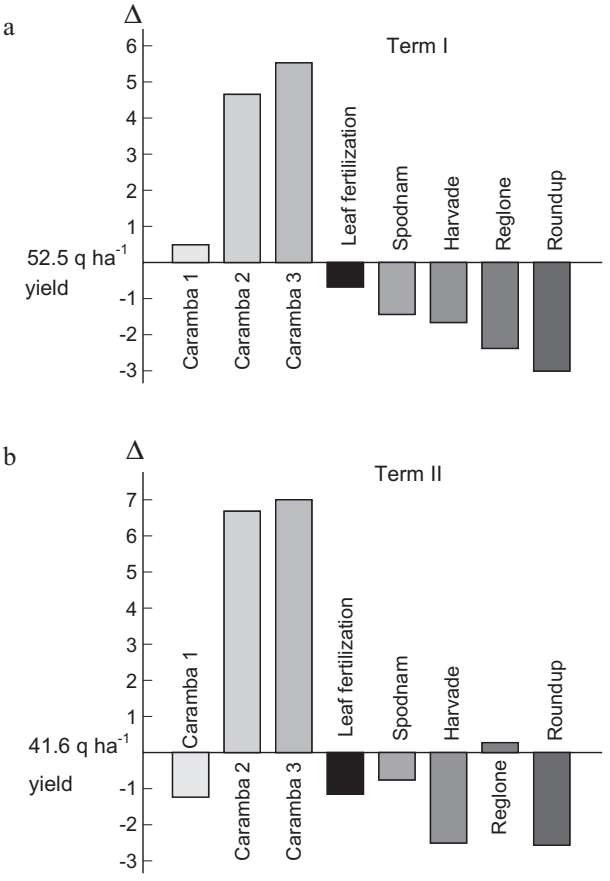

Fig. 1. Influence of applied chemicals and term of harvesting on the yield of seeds (Δ yield).

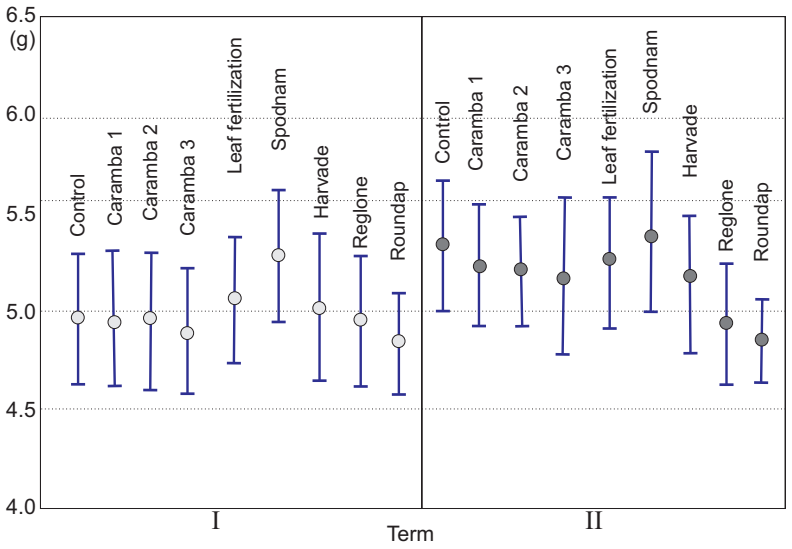

Fig. 2. Influence of applied chemicals and term of harvesting on MTS: I – full maturity, II – 10 days after full maturity.

Comparing agrochemicals used in our investigations it is required to assert, that application of Caramba 60 SL only in autumn decreased yield about 1.2 q ha^{-1}, but for other variants the increase of yield varied between 6.7 and 7 q ha^{-1}. Influence of other chemicals was negative, like as in a term I of harvest (with the exception of the treatment with Reglone 200 SL, where the yield was 0.2 q ha^{-1} higher than on the check plots).

The important factor which defines quality of yield is the mass of 1000 seeds (MTS). At a present investigation MTS was defined dependent on term of harvest of oilseed rape variety and also on applied chemicals (Fig. 2). The analysis of these data shows that there is no essential difference between investigated treatments on each stage of the harvesting. Essential differences appeared at the comparison of MTS from the sample area, which was treated by Roundup 360 SL and seeds were gathered in the term I and MTS from the area, which was treated by Spodnam 555 SC and seeds were gathered with the 10 days delay. In spite of an absence of visible difference exists a certain tendency. It should be noticed that in the term II of harvest MTS was greater except treatments with Reglone 200 SL and Roundup 360 SL. Also, it is necessary to pay attention to the increasing (in two terms of harvesting) of MTS in combinations in which Spodnam 555 SC was used.

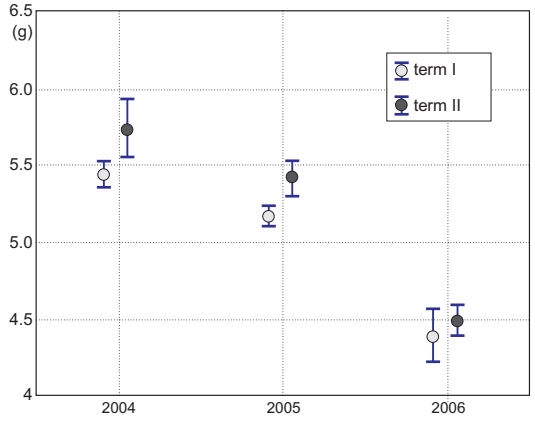

Fig. 3. Influence of weather conditions in the analyzed years and term of harvesting on the MTS value.

Figure 3 shows values of MTS dependent on variety and term of harvest. Taking into consideration the period of investigations, it is important to pay attention that the best year for seeds productivity was 2004. Also, it should be noticed that MTS from yield harvested in the term with the delay in 2004 and 2005 had much higher values then seeds gathered in the term I. While, in 2006 there was no essential deference between gathering of seeds in the term I and in term with the delay.

Analyzing the influence of characteristics of varieties on MTS it is important to pay attention to absence of the essential difference (Fig. 4). There is also no difference if to take an account variety and term of harvest. But we can mark out significant tendency that shows that MTS of Lisek variety always is lower than MTS of Kaszub variety. Also, seeds productivity in the term II is much more higher that in the term of gathering.

CONCLUSIONS

1. The obtained results specify that the delay of harvest of rape has a substantial influence on the yield of seeds. Losses from that delay can account for as much as 10.9 q ha^{-1}. Application of Caramba (especially in the variant of B and

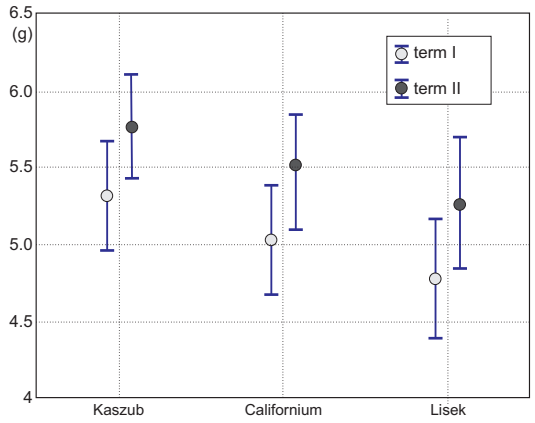

Fig. 4. Influence of characteristic of variety and term of harvesting on MTS.

C) had a substantial influence on the yield growth (about 5-6 q ha^{-1}) at collections in the term I (full maturity), and even stronger in the term II (6-7 q ha^{-1}).

2. The applied regulators of ripening (especially Reglone and Roundup) had a negative influence on the yield growth, causing its decrease of about 2-3 q ha^{-1} (Reglone alone applied in the II term (10 days after full maturity) of harvest had a very slight impact on the yield growth).

3. Applied chemicals modified mass of 1000 seeds (MTS) only in an insignificant way (statistically unimportant). Substantial differences were found only between control and combination where Roundup was applied – but only in the term II of harvest. The meaningful decrease of MTS was also found on the combination where Reglone was applied. However, they were statistically insignificant.

4. The most useful conditions influencing MTS appeared in 2004. MTS, in 2004, was significantly higher in comparison with 2005 as well as 2006 (when seed ripness was the worst).

5. Seeds harvested in the second term had a considerably higher MTS (with the exception of 2006 when these differences were statistically insignificant).

6. A variety of seeds searched did not differ significantly concerning MTS, but the Kaszub seeds led to a greater ripeness than the Lisek ones.

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