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PRODUCTION, RECEPTION AND PROCESSING OF SOYBEAN SEEDS IN 2017

PROIZVODNJA, PRIJEM I DORADA SEMENA SOJE U 2017. GODINI

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ABSTRACT

Compared to the 2016 growing season, in which the record soybean production was achieved owing to exceptional environmental conditions, the 2017 growing season cannot be considered favourable to soybean seed production. The start of the 2017 growing season was marked by heavy rainfall and the air temperature levels at a multi-year average. Conversely, dry weather with high air temperatures at the time of pod formation and subsequent seed filling had a negative effect on yield formation, resulting in an average soybean yield of about 1.5 t/ha, i.e. more than 50 % lower than the yield obtained in 2016. The 2017 soybean harvest started in late August and ended during September. The seed moisture recorded in post-harvest seeds ranged from 7.1 % to 13.9 %. Seed germination ability was found to be greater than 85 % in most of the post-harvest seeds. Soybean seed processing has been carried out in a timely manner, without major disturbances.

Keywords: *harvest, processing, production, reception, soybean*

REZIME

Za razliku od rekordne proizvodnje soje u 2016. godini, koju su pratili izuzetno povoljni klimatski uslovi spoljne sredine, za 2017. ne može se reći da je pogodovala proizvodnji ove biljne vrste. Zbog veoma hladnog i kišnog proleća, period klijanja i nicanja značajno je produžen, međutim, zahvaljujući kvalitetnom semenu, usevi su dobro ponikli, pri čemu su ostvareni željeni sklopovi. Početak vegetacionog perioda obeležen je obilnijim padavinama i temperaturom vazduha koja je bila na nivou višegodišnjeg proseka. Međutim, period formiranja mahuna i kasnije nalivanja semena (kritični period) bio je sušan i praćen visokim temperaturama vazduha, što je imalo negativne posledice po formiranje prinosa. Zbog toga je ostvareni prosečni prinos soje od oko 1,5 t/ha bio manji za više od 50% u odnosu na 2016. godinu. Žetva soje započela je krajem avgusta meseca, a ovaj posao završen je tokom septembra. Vlažnost požnjevenog semena bila je u rasponu od 7,1% do 13,9%. Ipak, najveći deo semena zaprimljen je u doranim centrima sa vlažnošću između 9% i 12%, što je jako važno s obzirom na mehaničke osobine semena soje. Najveći deo semena požnjeven je sa klijavošću većom od 85%. Na kraju, može se zaključiti da je ostvareni kvalitet naturalnog semena dobar, a da će požnjevena količina semena nakon dorade biti dovoljna za setvu soje u 2018. godini. Dorada semena soje počela je na vreme i bez većih problema. Prve analize kvaliteta dorađenog semena potvrđuju očekivanja da će proizvođači soje ove godine imati na raspolaganju kvalitetno seme.

Ključne reči: *soja, proizvodnja, žetva, dorada*

INTRODUCTION

The soybean production in 2017 was characterized by a continuous increase in soybean cultivation area (Figure 1). The record soybean production in 2016, stable prices and secured marketing resulted in exceeding the limit of 200,000 ha devoted to soybeans for the second time in the past 10 years. The soybean growing area in 2015 amounted to 210,000 ha, thus exceeding the soybean growing area recorded in 2017.

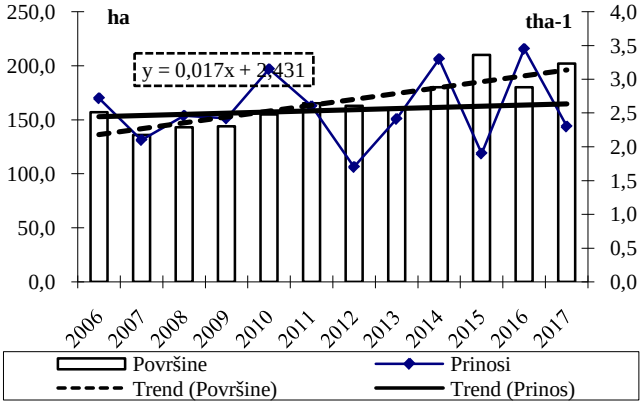

Fig. 1. Soybean growing area and yield in the period 2006-2017

Consequently, a continuous trend of soybean production increase in Serbia is clearly evident. Considering the increasing demand for non-GMO foods in Europe, soybean breeding teams have been established in countries with no or poor previous experience in soybean cultivation: Switzerland, Austria, Germany, etc. *(Miladinović et al, 2016).* Based on the unofficial data of the Business Association „Industrijsko bilje“, the soybean growing area in Serbia amounted to 230,000 ha in 2017, with an average yield of 1.5 t/ha *(Đukić et al. 2018)*. However, according to the official data of the Statistical Office of the Republic of Serbia *(webrzs.stat.gov.rs)*, the soybean harvested area in Serbia in 2017 was 201,712 ha, resulting in a total soybean production of 461,272 t, with an average yield of 2.3 t/ha. The total soybean production in 2017 was therefore significantly lower than the record 2016 soybean production (576,446 t), or at the same level with 2015 (454,431 t).

MATERIAL AND DISCUSSION

Soybean production in 2017

Unlike the record soybean production in 2016, characterized by particularly favourable weather conditions, 2017 cannot be deemed conducive to soybean production. Due to very cold and rainy spring weather conditions, germination and sprouting periods were significantly extended, although crop sprouting and the desired crop canopy were achieved owing to high-quality seeds. The onset of the vegetation period was marked by heavy rainfall and the temperatures at a multi-year average. During this period, plants had an ample amount of water supply, leading to the shallow root system formation in the surface soil horizon. High temperatures and drought occurred in the period of pod formation and seed filling, i.e. the critical period. Poor root system development hindered the deep-soil water supply to soybean crops, which negatively affected the yield. Only a total rainfall of 318 mm was recorded during the soybean vegetation period with extremely unfavourable distribution. In April, May

and early June, the recorded rainfall was 190.2 mm, whereas only a rainfall of 34.9 mm was recorded from mid-July to mid-August. Rainfalls of 10.9 mm and 82 mm were recorded in late August and September, respectively *(Đukić et al. 2018)*. Rainfall exerted a positive effect on the yields of late-maturing soybean cultivars, compared to a negligible impact on early- and medium early-maturing cultivars due to the onset of forced seed maturation. Unfavourable weather conditions caused the formation of small and insufficiently filled seeds with a low 1000-seed mass. Moreover, low seed moisture during harvest increased mechanical seed damage, thus causing harvest losses.

Reception, storage and processing of soybean seeds

The soybean seed reception at processing plants started in late August with seeds originating from the plots which suffered the greatest damage caused by drought. In addition to a decrease in yields, unfavourable production conditions also exerted adverse effects on the quality of natural seeds. Seed moisture was lower than 10 %, whereas an increased amount of green and sickly seeds was recorded in unharvested pods. Seeds were very small, causing a decrease in the 1000-seed mass and seed germination values compared to seeds produced under favourable conditions. Fortunately, a small number of the plots examined were in poor condition so the quality of natural seeds improved significantly with continued harvesting. Kostić et al. (2013) found that the seed size affected the initial growth of plants, as well as the seed germination. The moisture content of harvested seeds generally ranged from 7.1 % to 13.9 %, although the majority of seeds received at processing plants contained a moisture content of 9-12 %. The soybean seed reception was carried out carefully and without delay in order to minimize the risk of mechanical seed damage. Low-quality seeds (poor plot surfaces, no irrigation, etc) were separated from good-quality seeds, which required an additional yet necessary effort. However, the harvested seed germination exceeded 85 %, which is an important precondition for further processing. As large soybean growing areas were cultivated under the system of soybean seed production, the effect of drought was partly reduced, resulting in positive effects on the seed quality and yield. Regardless of the poorer seed quality, compared to that obtained in the previous year, the seed reception was undisturbed and completed during October. The soybean seed harvest was well organized and completed without delay as combine harvesting was terminated only during the days with heavy rainfall. A number of processing plants were filled to capacity due to a small grain seed storage (which hindered the seed reception), whereas other were completely incapable of receiving any soybean seeds whatsoever. The purity of harvested seeds varied from 92.2 % to 99.9 %, whereas the content of crushed seeds ranged from 0.2 % to 22.7 %. Notably, most of the received seeds exhibited a seed purity of over 98 % with a crushed seed total of 5 %, which is a good result considering the specific conditions of soybean production. The 1000-seed mass ranged from 106.4 g to 193.2 g, although in addition to weather conditions, this quality parameter also greatly depends on the genotype *(Kostić, 2016).* The seed germination capability varied from 48,6 % to 98 %. Seeds with a germination capability of less than 75 % were classified as commercial according to a minimum seed germination of 75 % stipulated for seed crop trade in official rules and regulations *(Rulebook on the Quality of Seeds of Agricultural Plants, Official Gazette of SFRY No.47/1987).* The seed germination obtained in most of the natural seeds was above 80 %, indicating the successful soybean seed production in 2017. In conclusion, the achieved quality of natural seeds is good, whereas the harvested amount of processed seed will be sufficient for the 2018 sowing season.

Seed processing began without delay or complications. The required documentation for seed processing (crop registration certificates) was duly obtained, allowing timely seed processing. Seed processing orders arrived with delay at some processing plants, thus causing longer seed storage, which was not recommendable this year. After seed processing, lower seed germination was recorded in some processing plants.With regard to the soybean seed input quality and susceptibility to crushing, seed processing had to be carefully planned and conducted, using well-prepared equipment and high-quality grain buffers. Moreover, the technology scheme was adjusted to seed quality and carried out in full to reduce the possibility of seed damage during processing. This required sufficient knowledge, expertise, experience and effort of the workers engaged in the soybean seed processing. The seed processing plants which applied the abovementioned practices achieved a far better quality of the processed seeds. As a result, the seed purity obtained was mostly above 99.0 %, which is a very good result considering the legal requirement of 96 % as the minimum seed purity *(Rulebook on the quality of seeds of agricultural plants, Official Gazette of SFRY No.47/1987).* The soybean seed germination exceeded 85 % in most of the processed seeds. The processed seed with a germination of less than 75 % was classified as commercial.

Based on the analysis, good-quality soybean seeds will be provided to soybean producers during the 2018 production season.

CONCLUSION

The soybean production in 2017 was characterized by unfavourable weather conditions compared to the 2016 soybean production. Although the soybean growing area in Serbia exceeded 200,000 ha in 2017, a total soybean production of 461,272 t was lower than that achieved in 2016. The 2017 soybean seed reception started in August and ended in October. Regardless of the varied storage capacity available at seed processing plants, the reception and processing of soybean seeds were carried out effortlessly and assiduously so as to preserve or improve the natural seed quality. As a result, the seed germination of processed seeds exceeded 85 %, thus ensuring good-quality seed for the 2018 growing season. Smaller seed amounts, lacking the desired qualities, were classified as commercial.

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