

Effect of planting date of soybean (*Glycine max* (L.) Merrill) on cultivars growth and yield

In the current dissertation the results of three-year studies conducted in two spots were discussed. From 2017 to 2018 the experiments were set up in the fields of the Institute of Agroecology and Plant Production in Pawłowice, while in the last year of research (2019) plots were situated at the SDOO in Zybiszów. The purpose of the studies was to find out the reaction of soybean varieties belonging to different groups of earliness (medium early - Merlin) (late - Alligator and Lissabon) for different sowing dates. The experiments were set up in four replications, in a "split-plot" arrangement for two variable factors, which were:

A. Dates of sowing: I. the earliest - half of the second decade of April; II. delayed by 10 days from the first date; III. delayed by 20 days from the earliest date.

B. Cultivars: Alligator, Lissabon, Merlin.

The working hypothesis assumed that the sowing date will significantly affect the length of soybean vegetative and generative development, as well as the elements of the crop structure – the yield and its quality.

The detailed purposes of the study were to determine the influence of sowing dates and cultivars on:

1. the length of the vegetative and generative development period and the vegetation period,
2. shaping morphological features of soybean and yield structures as well as seed yield,
3. chemical composition of seeds,
4. efficiency from seeds of major nutrients,
5. profitability of cultivation.

The range of research included:

- field experiments,
- chemical composition analysis,
- economic calculation.

1. In the close vicinity of Wrocław, delaying the sowing date by 20 days compared to the earliest date caused a reduction in the total length of the day during vegetative and generative development by 16% and 10%, respectively, and it also resulted in an average increase in day length during vegetative development of 0.45 hour and a reduction in the

length of the day during generative development by 0.1 hour, and shortened the length of the vegetative and generative development period by 23% and 7%, respectively.

2. Delaying of sowing term by 20 days relative to the first and the earliest term shortened the length of vegetative period by 12 days and generative term by 6 days.

3. On average for three years, Alligator cultivar had the longest growing season (133), followed by the shorter Lissabon (132) and Merlin (129).

4. The number of plants after emergence, in comparison to the first sowing date, was lower by 7% in the 2nd and 29% 3rd one. The most plants after emergence were noticed in Merlin cultivar. In comparison to this one Lissabon and Alligator had less emerged plants (%) 14 and 17, respectively.

5. In comparison to the first date, the sowing delayed by 20 days increased (%) the height of the plants by 15, the number of pods and seeds from the plant by 43 and 40, respectively. Moreover, it has reduced the height of embedding of the first pod by 22% and the mass of 1000 seeds by 6% .

6. Lissabon versus Merlin obtained higher values (%) in relation to the number of branches - 35, the number of pods and seeds from the plant by 13 and 17, respectively, the number of seeds in the pod - 5, the weight of seeds in the pod - 10 and the weight of 1000 seeds by 7.

7. In the first sowing date, compared to 3rd one, higher yields (%) were obtained for: seeds - 7, total proteins - 14, crude fat - 8, and post-harvest residues - 27. In comparison to the Merlin cultivar, higher seed and total protein yields by 7 and 9% were obtained from the Lissabon cultivar.

8. From the examined factors, on average in three years, the sowing date differentiated the content of total protein and nitrogen-free extracts in seeds, the genetic factor had an impact on the content of crude fat, and the weather over the years verified the level of total protein, fat and fly ash.

9. The sowing delay by 20 days compared to the earliest date caused an increase in the cost of production of 1 t of seeds and 1 kg of protein by 7.2% and 13.9%, respectively, and a decrease in income by 68.8%.

10. On average for cultivars, the highest income was received from the Alligator cultivar, followed by lower (%) from Lissabon - 12.5 and Merlin - 54.7. In comparison to the Alligator cultivar, the cost of producing 1 ton of seeds was higher for Lissabon by 1.6% and Merlin by 6.8%, and the cost of 1 kg of protein by 3.3% and 7.6%, respectively

11. On the basis of three-year average cultivation costs of 1 ha of soybeans equal PLN 3420.34 and with a selling price of 1 ton of seed PLN 1505, the break-even point, without subsidies, is obtained with a yield of 2.27 t per ha.