

Formation of A High-Quality Crop of Vegetable Soybeans with Repeated Cultivation On Gray-Soil Soils of Uzbekistan

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Abstract

Cultivation of vegetable soybeans in re-cultivation after growing winter cereal crops and early vegetable crops will bring substantial profits while obtaining valuable high-protein products and improving soil fertility. The results of our studies are described and it was found that with later summer sowing periods, a significantly smaller number of beans is formed on one plant and their size decreases. With the sowing date June 20, the number of beans in the resulting crop was 58 pcs / plant, and the average weight of 1000 green seeds of beans was 675 g, and with a late sowing on July 30 was, respectively, 31 pcs. /plant and 610 g.

Keywords: vegetable soybeans, repeated sowing dates, yield, quality of beans, economic effect,

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INTRODUCTION

The technology of cultivation of vegetable soybeans is in many ways similar to the technology of growing grain soybeans, as well as other vegetable legumes. However, the agricultural technology of vegetable soybeans has its own specificity, due to morphological features, the height of the bush, the structure of the leaf blade, the climatic adaptability of cultivation [3; 6].

Sowing at an earlier date during the cold spring delays germination up to 15 days or more, which usually leads to the death of some of the seeds and significant thinning of seedlings. Likewise, later sowing, in addition to a decrease in yield, cause significant complications during harvesting and storage of the crop due to the increased moisture content of grain and stems during soybean ripening [4; 8].

Soybeans are light-loving, heat-loving and moisture-loving crops. Seeds begin to germinate at + 10 ° C. Plants experience a special need for warmth during the periods: budding - flowering (+22 ... 25 ° C), bean formation - filling seeds (+20 ... 25°C) and ripening of beans (+18 ... 20 ° C) ... For sowing soybeans, a sufficiently warm soil is required. Soybean seeds sown in such soil sprout in 7-8 days. Early sowing in cold soil delays seed germination and seedlings appear 18-20 days, and sometimes even later. During this time, in moist cold soil, a significant part of the seeds loses their germination, rots in the soil, so you should not be in a hurry with soybean crops [10; 12].

At later sowing dates, the ripening of vegetable soybean beans is delayed and the yield decreases slightly. Sowing calendar dates for different climatic zones are different. The results of studies on establishing the timing of sowing and the accumulated experience on this issue in various zones of vegetable growing in the world are widely covered in the literature [1].

Both early sowing and delay in its implementation are undesirable. In the first case, the crop shortage will be due to sparse seedlings due to the death of seeds from diseases and low temperatures, in the second case - at a later date, the growing season of vegetable soybean plants is delayed until August, while the yield is low. This does not make it possible to free the field for repeated crops (green vegetables, radish, corn for green fodder, etc.) [2; 14].

In the conditions of Ukraine, considering the demanding culture for heat, the optimal sowing time for the Kiev region is the first ten days of May. It is necessary to sow in film greenhouses on solar heating at the beginning of the second decade of April. Planting should occur in 25-30 days. Sowing of late varieties in the steppe zone and all zoned varieties in the forest-steppe zone should begin after the end of sowing of early spring crops and end no later than May 10 [9].

The timing of sowing soybeans is of decisive importance, since the growing season, the timing of its ripening, the formation of a high yield and the quality of products depend on them. As a result of many years of research on soybean crops in Russia, the optimal timing of soybean sowing has been established in the western regions: in the center and south of the subzone - the last ten days of April, in the north - the first ten days of May. Thus, the strategic direction in choosing the sowing time is to consider all the agrobiological properties of varieties or hybrids, specific soil and climatic conditions and the possible consequences of changing the recommended sowing time [11].

In Japan, China, Korea, India, Taiwan and other countries, exclusively vegetable soybeans are grown. In China, vegetable soybean seeds were first used for medicinal purposes, and then it entered the diet of the Chinese. Sowing dates are divided into spring and summer.

Spring sowing lasts from late February to March 20, and summer sowing - from June 1 to July 10 [13].

II. METHOD

To establish the optimal summer period for sowing vegetable soybean seeds of the Universal variety, we studied 5 sowing periods in 2015-2020, with 10-day intervals: June 20, July 1, 10, 20 and 30, the control sowing option was July 10. The plot area was 12.5 m², with 4-fold repetition, and 70 × 20 cm seeding scheme. Experimental data was processed using Microsoft Excel 2007 considering the methodological recommendations of Dospekhov B.A. (1985), Crop Stat.

III. RESULT AND DISCUSSION

Analysis of the temperature indicators of the air made it possible to establish that seed germination from the first to the last sowing period occurred with a gradual increase in temperatures. During the period of seed germination and emergence of seedlings, the average daily temperature from June 20 to July 30 ranged from +26.6 to +29.5 °C. When sowing in these terms, seedlings appeared 3-5 days after sowing. Field germination of seeds at all sowing dates was high - from 91.5 to 96.6% (Table 1).

Observations showed that the later the sowing was carried out, the higher the average daily air temperature was. The difference in temperature indicators during the growing season in all five sowing periods was significant: the period "shoots-formation of the first true leaf" - 1 °C, during the period "shoots-flowering" - 3.2 °C, during the period "seedlings-setting of beans" - 5.1 °C, during the period of "germination-technical ripeness" - 4 °C.

Table 1. The emergence of seedlings of vegetable soybean variety "Universal" at different sowing dates (2015-2020)

Sowing dates	Average daily air temperature in the pre-emergence period, °C	Field germination of seeds	The number of days from sowing to germination	
			Start (10%)	Mass (75%)
June 20	29,3	94,4	3,0	4
July 1	29,4	93,7	3,0	4
July 10 (control)	29,8	92,4	3,6	4
July 20	28,6	96,1	4,0	5
July 30	28,1	96,6	4,0	5

The duration of the interfacial periods at different summer sowing dates was different and amounted, respectively, during the periods of "shoots-formation of the first true leaf" - to 10-11 days, "shoots-beginning of flowering" - to 31-35 days, "shoots-bean setting" - to 39-45 days and "germination-technical ripeness" - to 62-71 days.

It should be noted that during sowing, from June 20 to July 30, the average daily temperature gradually increased. The day of the equinox begins on July 22, and then the days become shorter and the nights longer, therefore, with later sowing dates, from July 20 to 30, the "sprout-flowering" period was delayed by 4 days, in comparison with early sowing on June 20 (Fig. 1.).

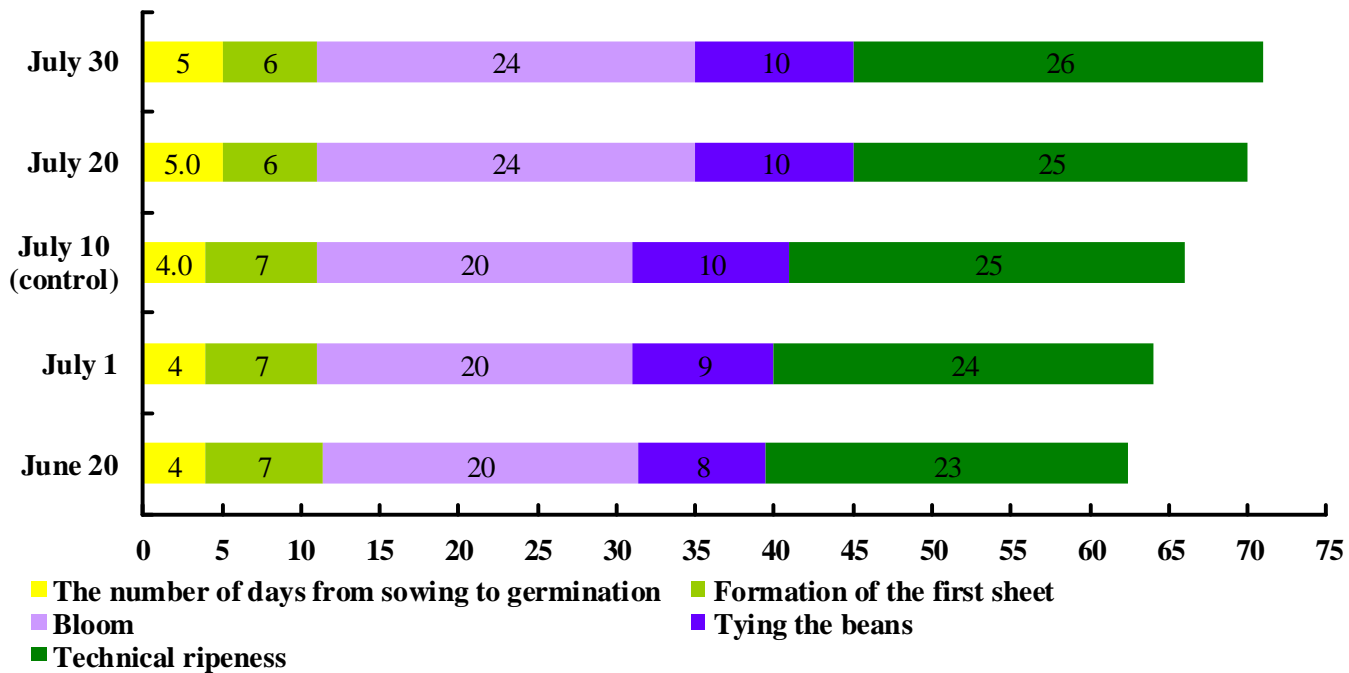


Fig. 1. Duration of interfacial periods for vegetable soybean variety Universal at different sowing dates

The same pattern was observed in the periods of "seedling-bean setting" - for 6 days, the period "seedling-technical ripeness" - for 7 days.

The technical ripeness of vegetable soybeans at the sowing dates on June 20 came on the 62nd day and on July 1 came on the 64th day, in the control period on July 10th - on the 66th, on July 20th - on the 70th and July 30th - on the 71st day.

Optimum soil moisture in all variants of the experiment was ensured by irrigation along the furrows.

It was found that the later the sowing was carried out, the longer the vegetation period of the plants and the ripening period of the beans. This is due to the fact that in the month of September the air temperature decreases. Temperature drops are especially felt at night. In late September - early October, the first rains fall, which also affects the decrease in the average daily temperature [15].

It was found that at all sowing dates for the period of research, vegetable soybean beans fully ripened to technical ripeness and a full crop of beans in technical ripeness was collected (green beans).

Therefore, when sowing was on June 20, the temperature conditions favored the better development of the soybean plants, which led to the formation of more beans, and this determined the yield of the plants.

The most important indicator for different summer sowing periods is the yield of soybeans in the technical ripeness phase. The above data show that the largest total yield was obtained when sowing was on June 20 - 88.6 c / ha, this is 104% compared to the control crops. In comparison with it, a decrease in yield was observed in subsequent sowing periods. The lowest yield was at the fifth sowing date on July 30 - 79 kg / ha (93% to control). The rest of the sowing terms in terms of yield took an intermediate position from 86.5-82 c / ha.

The highest marketable yield was observed at the date of June 20 - 84.5 c / ha (105% to the standard), and the lowest at the date of July 30, 67.2 c / ha (83% to the standard). In the control variant on July 10, the marketable yield was 90.7 kg / ha (Fig. 2.).

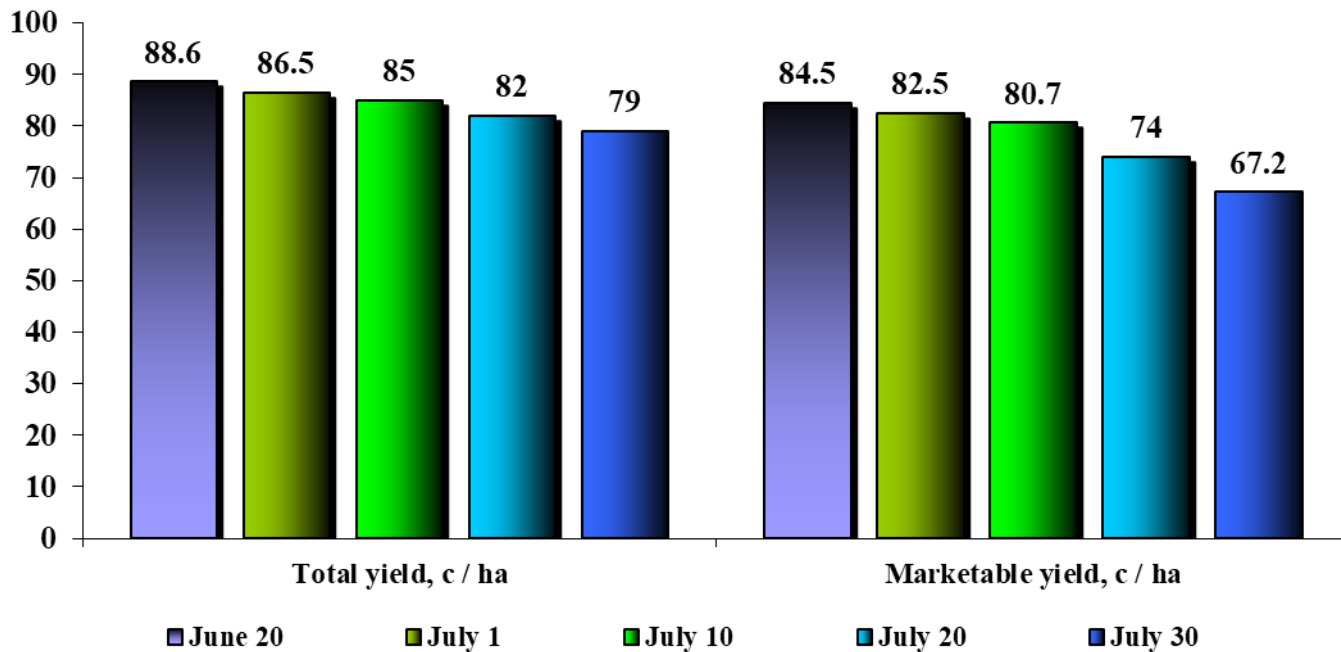


Fig. 2. The total and marketable yield of vegetable soybeans of the Universal variety during summer sowing

Sowing dates had a certain impact on the marketability of the crop. Our studies have shown that the highest marketability of the crop in the technical ripeness of beans was observed when sowing on June 20 - 95.4%, in the control sowing date on June 10 - 92.0%. When vegetable soybeans were sown at earlier dates and later dates, marketability decreased by 85.1-95.4%.

Average statistical data showed that the difference between sowing dates exceeded the NDS and was significant.

We found that in terms of yield and marketability of green beans, the best sowing time is the end of June - the first ten days of July. This is confirmed by our experimental data on the number of beans and seeds in them on one plant, as well as the weight of beans [5].

The sowing dates had a certain effect on the formation of the number of beans on one plant. The largest number of beans was noted at sowing on June 20 - 58 pieces / plant. Both in earlier and later periods, the number of beans was in the range from 24 to 58 pcs. /plant.

Average weight 1000 pcs. green seeds also depended on the timing of sowing. Thus, this indicator slightly increased with the sowing date on June 20 and amounted to 675 g. At later sowing dates, the average weight of beans slightly decreased from 675 to 610 g.

As a result of our research, it was found that, on average, over the years of research, the highest total and marketable yield was formed when the season of sowing of vegetable soybean variety Universal was June 20. At the same time, the value of the marketable yield in relation to the control crop (sowing on July 10) was: with the sowing date June 20 - 105%, July 1 - 102%, July 20 - 92%, and the lowest yield was at the sowing date July 30 - 83 %.

During the research period, we carried out preventive measures to combat pests to protect plants and no diseases or pests were observed in the experimental site.

The optimal sowing time for vegetable soybeans ensures the best ripening of green beans and a high-quality harvest.

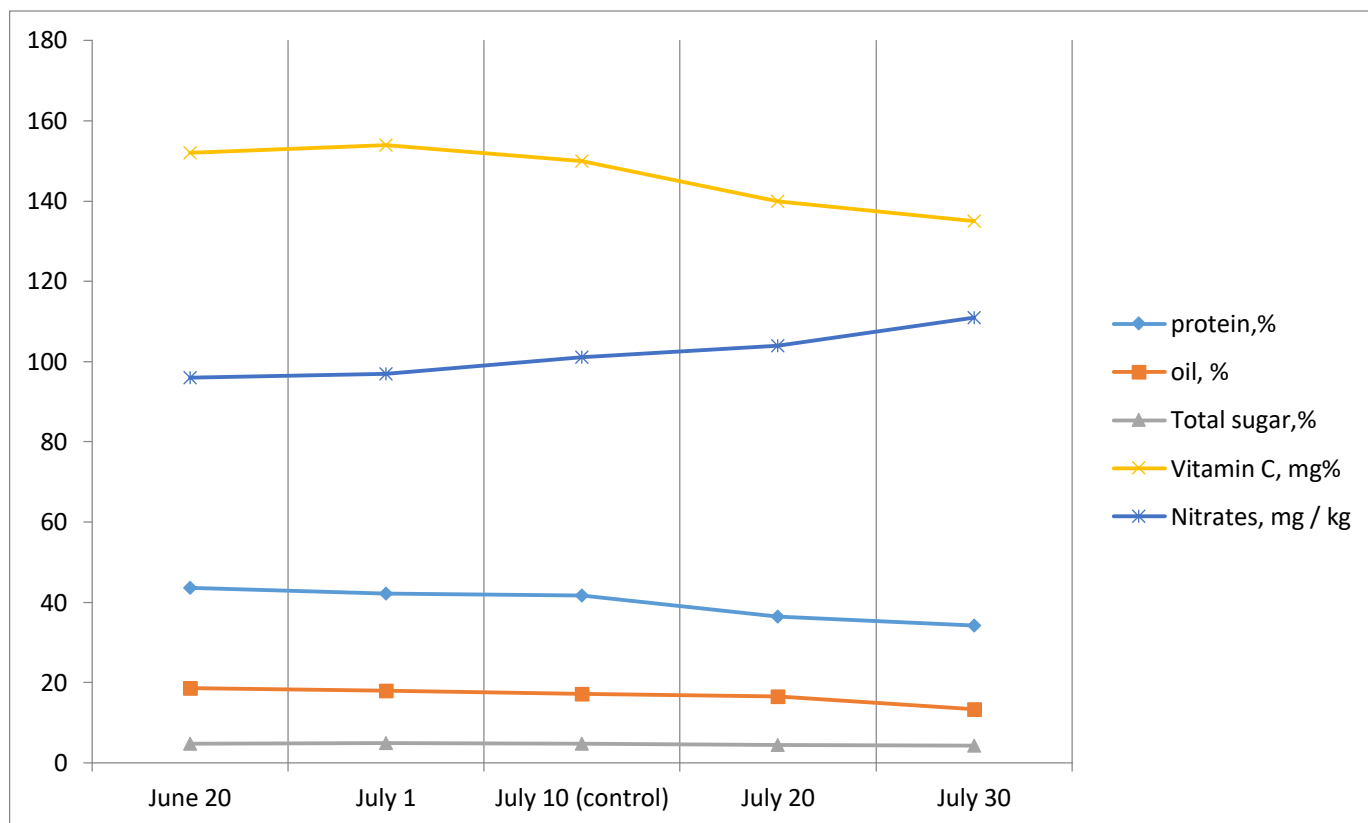
At different sowing times, the vegetation of a vegetable soybean plant from the beginning of the formation of beans and the onset of the phase of technical ripeness took place under different temperature and light conditions. This has a significant effect on the physiological and biochemical processes, and as a result, on the biochemical parameters of the grown products.

Biochemical analysis of vegetable soybean beans, carried out in the phase of technical ripeness (green beans), showed that with the postponement of sowing at a later date, the content of the main components of the chemical composition decreases slightly.

Studies have shown that the dry matter content of soybeans at sowing on June 20 was 82.5% and decreased at the last sowing date on July 30 to 69.6%. In soybeans, the amount of dry matter decreased slightly depending on the sowing time (Figure 3).

The timing of sowing had a definite effect on the change in protein content. On average, over the years of research, the highest protein content in the beans of vegetable soybean of the Universal variety was 43.6% at the early sowing date on June 20, and 34.2% at the late sowing date on July 30, in the remaining periods the protein content was within 36, 5-42.1%.

A high content of crude vegetable oil was noted at sowing on June 20 - 18.6%, at a late sowing date on July 30, the fat content was 13.3%.



The timing of sowing vegetable soybeans had a definite effect on the change in the total sugar content in soybeans. With the transition from early to later sowing dates, this indicator

slightly decreased (from 4.8 to 4.2%), which is also associated with a change in climatic conditions.

In vegetable soybeans, as in all vegetables, the content of ascorbic acid (vitamin C) is of great importance. The research results showed that the content of ascorbic acid decreases slightly from early June 20 (152 mg%) to later sowing dates July 30 (135 mg%). The same pattern was observed for the accumulation of starch in the early sowing period on June 20 (3.26%) and later before (2.91%). Consequently, all biochemical parameters decrease somewhat at later sowing dates compared to early sowing.

When calculating the economic efficiency of soybean cultivation, we used the following indicators: yield, sales income, net profit, costs and the level of profitability.

The cost of all costs and harvest were taken at prices of 2015-2020. The yield by sowing time was taken as the average yield. The cost of production was taken as a wholesale price of 450.0 sums per 1 kilogram of green beans (green beans) for the years of research.

The cost of purchasing seeds for all sowing periods amounted to 359 thousand sums / ha (75 kg at 4.78 thousand sums) and fertilizers 337.6 thousand sums / ha (200 kg of ammonium nitrate, 300 kg of ammophos, 300 kg of potassium chloride 422 sum / kg).

The highest marketable yield of the Universal variety was noted with the sowing date on June 20 - 84.5 t / ha, the lowest on July 30 - 67.2 t / ha, in the control variant on July 10 - 80.7 t / ha. The average selling price for all sowing dates was 450 sums / kg, while the highest income from sales was obtained with the sowing period on June 20 - 3802 sums / ha, and the smallest at 30 July - 3024 sums / ha [7].

Net profit for different summer sowing periods slightly differed and amounted to 352.2-1059.4 sums per hectare, in the control variant - 921.8 sums / ha. Growing vegetable soybean variety "Universal" at various summer sowing periods was profitable and ranged from 13.2 to 38.6%, and in the control variant - 34%.

CONCLUSION AND IMPLICATIONS

1. As a result of our research, it was found that with later summer sowing periods, a significantly smaller number of beans is formed on one plant and their size decreases. With the sowing date June 20, the number of beans in the resulting crop was 58 pcs / plant, and the average weight of 1000 green seeds of beans was 675 g, and with a late sowing on July 30 was respectively, 31 pcs. /plant and 610 g.

2. It was found that the best sowing dates were June 20 and July 1. When sowing in these terms, the total yield in technical ripeness (green beans) was 88.6 and 86.5 c / ha, and marketable - 84.5 and 82.5 c / ha. When sowing on July 30, these indicators were 79 and 67.2 c / ha, respectively. The output of marketable products for all summer sowing periods was at the level of 85.1-95.4%.

3. The timing of sowing influenced the biochemical composition of vegetable soybeans in the technical ripeness phase. It was also observed that the dry matter in the green seeds of vegetable soybeans varied depending on the sowing time. When sown on June 20, it was 82.5% and decreased at the last sowing date on July 30 - 69.6%. The same pattern is noted for other elements of the chemical composition. When sown on June 20 in beans, the protein content was 43.6%, fat - 18.6%, total sugar - 4.8%, ascorbic acid (vitamin C) - 152 mg /%, starch - 3.26%, and with sowing on July 30, these figures were lower, respectively: 34.2%, 13.3%, 4.2%, 135 mg% and 2.91%. It was found that in vegetable soybeans the content of nitrates was in the range of 111-96 mg / kg, which is lower than the MPC (200 mg / kg).

4. Considering the yield and nutrient content of the Universal vegetable soybeans, we recommend the optimal summer sowing dates from June 20 to July 1. If the harvesting of the previous crop and the preparation of the soil for sowing is delayed, the use of crops is also permissible on July 10.

Cultivation of vegetable soybeans in re-culture after growing winter cereal crops and early vegetable crops will bring significant profits while obtaining valuable high-protein products and improving soil fertility.

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