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## PRODUCT QUALITY IN MIXED CROPPING OF GROUNDNUTS (*Arachis hypogaea* L.)

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## КАЧЕСТВО ПРОДУКЦИИ В СМЕШАННЫХ ПОСЕВАХ АРАХИСА (*Arachis hypogaea* L.)

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*Abstract.* The article notes that the groundnuts crop yield in mixed cropping is the result of a combination of plant growth and development, photosynthetic activity, biomass harvesting and other aspects of increasing crop performance in specific soil and climatic conditions and depends on agricultural practices. In indoor practice, it has been found that the use of mixed cropping not only increases crop performance, but also improves crop quality. The amount of oil contained in groundnuts seeds, along with fast growing tomatoes, increased by 2.7% compared to groundnuts sole cropping. When sowing groundnuts with potatoes, a slight decrease in oil content was observed (49.5%). The content of proteins in this variant decreased by 2.4–1.5% compared with groundnuts sole cropping. The quality of potato tubers, including the amount of starch, changed in mixed cropping. When mixed cropping groundnuts and potatoes, the starch content in potato tubers increased to 25%. The quality of the tomatoes has also changed. The amount of vitamin C contained in medium and early ripening tomato varieties increased to 17.3–17.9 mg/%. This is 0.6–0.9 mg/% higher than on tomato sole cropping.

*Аннотация.* В статье отмечается, что урожайность арахиса в смешанных посевах, а также в других смешанных культурах является результатом сочетания роста и развития растений, фотосинтетической активности, сбора биомассы и других аспектов увеличения продуктивности культур в конкретных почвенно-климатических условиях и зависит от агротехнических приемов. На практике в помещении было установлено, что использование смешанных посевов не только повышает продуктивность культур, но и улучшает качество урожая. Количество масла, содержащегося в семенах арахиса, наряду с быстро растущими томатами, увеличилось на 2,7% по сравнению с чистым посевом арахиса. При посеве арахиса с картофелем наблюдалось незначительное снижение содержания масла (49,5%). Содержание белков в данном варианте снизилось на 2,4–1,5% по сравнению с чистыми посевами арахиса. Качество клубней картофеля, включая количество крахмала, изменилось в смешанных посевах. При совместном посеве арахиса с картофелем содержание крахмала в клубнях картофеля увеличилось до 25%. Качество томатов также изменилось. Количество витамина С, содержащегося в средне- и скороспелых сортах томатов, увеличилось до 17,3–17,9 мг/%. Это на 0,6–0,9 мг/% выше, чем на чистых томатных посевах.

*Keywords:* groundnuts, potatoes, tomatoes, sowing, crop yield, mixed cropping, sole cropping, crop performance, fertilizers.

**Ключевые слова:** арахис, картофель, томаты, посев, урожайность, смешанные посевы, чистые посевы, продуктивность культур, удобрения.

The article notes that, as in other mixed sowings, the productivity of *Arachis* and other sowings and plants planted with it in the mixed sowings is a result of the combination of other aspects of plant growth and development, photosynthetic activities, biomass accumulation, and productivity in specific soil-climatic conditions and depends on agro-technical methods.

In practice, it is found that using mixed sowings improves not only the productivity of plants but also the quality of the products. The amount of fat in the *Arachis* seeds, along with the fast-growing tomatoes, increased by 2.7% compared to the pure peanut sowings. A lower percentage of fat was observed in the cultivation of *Arachis* with potatoes (49,5%), however, the amount of protein decreased in the indicated variant and this decrease was 2.4–1.5% compared to pure cultivation of *Arachis*.

Peanuts or *Arachis (Arachis hypogaea L.)* seeds are grown to obtain food oil (edible oil). *Arachis* seeds contain up to 48–6% of fat (53% on average) and 23–38% of proteins [1, p. 415; 2, p. 248]. Due to the amount of protein, it contains, the *Arachis* only fall behind the shade. *Arachis* oil is used in the canning industry, margarine, soap making, and medicine. *Arachis* oil belongs to a group of non-drying oils. On average, one ton of peanut seeds extracts 226–317 kg. oil [3, p. 19; 4, p. 356]. *Arachis* oil is used mainly in the canning and confectionery industry. As a result of our experiments, it was determined that, as in other mixed sowings, the productivity of *Arachis* and other sowings and plants planted with it in the mixed sowings is a result of the combination of other aspects of plant growth and development, photosynthetic activities, biomass accumulation, and productivity in specific soil-climatic conditions and depends on agro-technical methods [7, p. 81–86].

Peanuts belong to the legume family and have a taproot system, which goes to a depth of 1.5–2,0 m. Spreads to a radius of 1.5 m. The roots of this leguminous plant grow root bacteria that store nitrogen. Shrubs are the most cultivated. The shrubs are bowl-shaped, with a twisted branch in the center, and the body grows to a height of 50–60 cm.

The leaves are double feathered. The flowers are yellow, the clusters are twisted cones. In the underground stem, underground flowers develop, and as a result, the most valuable part of the product is formed. Peanuts are a self-pollinating plant. After the flower is fertilized, a part called the gynophore is formed in the lower part of the ovary, which first grows upwards, returns after 6–8 days, bends downwards, and reaches the soil to a depth of 8–10 cm. The development of the ovary into a bean also occurs here.

The gynophore, which cannot penetrate deep into the soil, does not produce beans. The fruit is a cocoon-like, mesh-covered bean with 1–6 seeds. The seeds are oval, elongated, the color is brown and red. Weight of 1000 seeds is 250–300 grams, small seeds are 450–600 grams. The vegetation period of hazelnuts is 115–130 days. This period can be extended to 150–170 days, with mid-early and late ripening. The seedlings emerge 8–10 days after sowing. Flowering begins 25–30 days after the germination phase and continues until harvest. During the growing season, the plant produces 600 or more flowers. The first flowers form at the base of the body. The life span of a flower is 2 days. With the onset of flowering, the surface of the peanuts grows intensively, therefore the plant's need for nutrients and moisture during this period increases significantly. It takes 45–50 days before flowering and fruit ripening. As in the cotton plant.

Peanuts are heat-loving plants, the seeds begin to germinate at a temperature of 10–12 °C. 0.5–1.0 °C frost destroys seedlings. Although peanuts are a moisture-loving plant, seedlings are

drought-resistant from the 280th phase to flowering. This plant is demanding on soil fertility and mechanical composition. 1 ton of beans and 2 tons of branches per hectare of land can carry the following amount of nutrients: 80-85 kg of nitrogen, 18-20 kg of phosphorus and 30-35 kg of potassium. Soils brought by wind or water are more suitable for peanuts.

Light mechanical black, gray, chestnut, gives good yields in soils. Heavy clayey, saline, excessively moist soils do not contribute to this plant. The best precursor for peanuts is autumn wheat. The main elements of fertilization technology are as follows: 20-30 tons of manure per hectare, together with phosphorus or phosphorus-potassium fertilizers, the approximate dose is P<sub>40</sub>, K<sub>80</sub> at full fertilization rates N<sub>40</sub>, P<sub>60</sub>, K<sub>40</sub>. Potassium is sown in soils that need this element. It is ineffective to give it on black soil. Under irrigation conditions, N<sub>40</sub> and P<sub>30</sub> should be fertilized per hectare in the pre-flowering phase and N<sub>60</sub> and P<sub>30</sub> in the mass fruiting phase [5, p. 460].

The relationship of the peanut plant to the length of daylight has not been sufficiently studied. Experimental results show that not all varieties of peanuts are equally concerned with the shortness of the day. There are varieties that are highly responsive to the sun, increasing yields, and there are those that do not. Thus, late-ripening varieties and forms of peanuts react more strongly to short days in comparison with medium-sized, especially early maturing varieties, reacting to a shorter period from germination to flowering by increasing the yield of beans [6, p. 7-11].

One of the important problems in the modern system of ecological farming is the problem of increasing the productivity of agroecosystems and the quality of products. The productivity of agrophytocoenoses and plants depends on their species composition and ecological characteristics. The types of plants planted here are of particular importance in the relationship of plants grown in agrophytocoenoses. Such species play an important role in the agricultural system. These species play an important role in the agricultural system. The cultivation of plants containing high-quality fats and proteins is of great importance in the Ganja-Gazakh region of Azerbaijan. One such plant is the peanut, which contains more than 50% fat. One of these plants is peanuts, which contain more than 50% fat. Peanuts are rich in protein (up to 45%) and essential amino acids. Peanuts (*Arachis hypogaea* L.) accumulate a large amount of organic matter, which has a positive effect on soil fertility and creates high environmental efficiency. Therefore, the sustainability and productivity of agrophytocoenoses are high and they provide environmentally friendly yields. The main research factor in the composition of agrophytocoenoses is the correct study of environmental conditions and full consideration of the biological characteristics of plants in the Ganja-Gazakh region. The study of these issues is one of the most pressing issues in modern agriculture. Maximum productivity of *Arachis* seeds (0.8 t/ha) was obtained from cultivation with accelerated tomatoes and potatoes, which is 33.3% higher than the productivity of pure *Arachis*. In our experience, we also determined that the use of mixed sowings has improved not only the productivity of plants but also the quality of the products (Table 1).

Table 1

THE AMOUNT OF FAT AND PROTEIN IN ARACHIS SEEDS IN PERCENTAGE (%)  
(Average for 2016-2018)

<i>Options</i>	<i>Fat</i>	<i>Protein</i>
Arachis (pure planting)	47,5	26,1
Arachis + accelerating tomatoes	50,2	23,7
Arachis + medium accelerating tomatoes	48,2	25,4
Arachis + medium ripening tomatoes	48,7	25,1
Arachis + potato	49,5	24,6

The amount of fat in the arachis seeds, along with the fast-growing tomatoes, increased by 2.7% compared to the pure peanut sowings. A lower percentage of fat was observed in the cultivation of arachis with potatoes (49,5%) however, the amount of protein decreased in the indicated variant and this decrease was 2.4–1.5% compared to pure cultivation of arachis. Obtained indicators confirm that, as mentioned in previous experiments, on the contrary, there is a dependence on the amount of fat and protein. The quality of potato tubers, including the quantity of starch, has changed. The quantity of starch increased by 25% in potato tubers from arachis planted with potatoes (Table 2).

Table 2

QUANTITY OF STARCH IN POTATO TUBERS IN PERCENTAGE (%)

Options	2016	2017	2018	Cp.
Potato	23,2	20,3	27,0	23,5
Arachis + potato	25,1	23,0	29,8	26,0

The highest percentage of starch (29.8%) was formed in 2018. The potato plant assimilation apparatus has been working for a long time and effectively when the climatic conditions become more difficult. Low levels of starch were observed in 2016 and 2017 as a result of photophoresis which is observed on the plant due to disorders of photosynthetic activity. In the period of formation of potato tubers, dependence between the amount of dry matter and the amount of starch in the potato tubers and the meteorological factors was established. The temperature should be 17–20 °C from the flowering period to the decay of the surface mass, the hydrothermal coefficient should not rise above 0.9–1.0, when there is sufficient heat and humidity, the temperature should be at least 300–350 °C for the accelerators and 600–650 °C for the average growers. In potato tubers, the amount of starch is 3.1–1.3% higher than in the soil with excessive moisture [8].

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