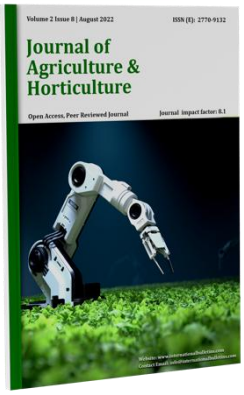

INFLUENCE OF SOWING TIMES AND STANDARDS ON THE GROWTH AND DEVELOPMENT AND YIELD OF PHATSILIA PLANTS

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Annotation: This article studies the effects of sowing dates and seed rates on growth and development processes, phenological stages and yield of Phacelia (Phacelia tanacetifolia Benth.). The results of the research showed that when sowing was carried out in early spring with optimal seed rates, the vegetative development of the plant was accelerated, the amount of biomass and nectar yield were higher. It was also found that late sowing dates shorten the phenological period of the plant and reduce the quality of the crop. The obtained data are of practical importance in developing an effective planting system of Phacelia as an intermediate crop in agriculture.

Keywords: phacelia, sowing date, seed rate, biomass, yield, nectar, agrotechnology.

Annotatsiya: Ushbu maqolada fatsiliya (Phacelia tanacetifolia Benth.) o‘simligini ekish muddatlari va urug‘ me’yorlarining o‘sish-rivojlanish jarayonlari, fenologik bosqichlari hamda hosildorligiga ta’siri o‘rganildi. Tadqiqotlar natijasida ekishning erta bahor davrida, optimal urug‘ me’yori bilan amalga oshirilganda o‘simlikning vegetativ rivojlanishi tezlashgani, biomassaning miqdori va nektar hosildorligi yuqori bo‘lgani aniqlangan. Shuningdek, kech ekish muddatlari o‘simlikning fenologik davrini qisqartirib, hosil sifatini pasaytirishi aniqlangan. Olingan ma’lumotlar fatsiliya o‘simligini qishloq xo‘jaligida oraliq ekin sifatida samarali ekish tizimini ishlab chiqishda amaliy ahamiyat kasb etadi.

Kalit so‘zlar: fatsiliya, ekish muddati, urug‘ me’yori, biomassa, hosildorlik, nektar, agrotexnika.

Аннотация : В данной статье исследовано влияние сроков сева и норм высева семян растения фацелии (Phacelia tanacetifolia Benth.) на её рост, развитие и урожайность. В результате опытов установлено, что при раннем весеннем посеве и оптимальной норме высева наблюдается ускоренное вегетативное развитие, увеличение биомассы и высокая нектаропродуктивность растений. Поздние сроки сева, напротив, сокращают продолжительность фенологических фаз и снижают качество урожая. Полученные результаты имеют практическое значение для разработки эффективной системы посева фацелии как промежуточной сельскохозяйственной культуры.

Ключевые слова: фацелия, срок посева, норма высева, биомасса, урожайность, нектар, агротехника.

In recent years, special attention has been paid to the issues of maintaining soil fertility, stabilizing the agroecosystem, and ensuring biodiversity in agriculture in our country. In particular, among technical and fodder crops used as intercrops, the phacelia (Phacelia tanacetifolia Benth.) plant occupies a special place with its agrobiological properties. This plant has a short growing season, improves the soil, serves as a source of nectar for beneficial insects, and creates an important food base in beekeeping.

Correctly determining the sowing dates and seed rates of Phacelia plants directly affects its growth and development processes and final yield. Sowing date is one of the main agrotechnical factors that determines the duration of the phenological stages of the plant, the intensity of nectar secretion, crop quality and biomass amount. At the same time, increasing or decreasing the seed rate also affects plant density, the efficiency of using light and nutrients.

Some studies have shown that early spring sowing of Phacelia crops prolongs their growing season and allows for higher yields. On the other hand, late sowing shortens the development stages of plants and reduces nectar yield. Therefore, it is practically important to determine the optimal sowing date and seed rate, taking into account the climatic conditions, soil moisture and agrotechnical requirements of each region.

Articles on the effects of bean planting dates and rates on growth and yield typically review studies aimed at determining the optimal time to plant beans. Studies typically analyze the variation in yield with planting date to determine the period that yields the highest yield.In particular, soil temperature, moisture, and bean variety characteristics are important factors in determining planting time. The effect of seeding rate on yield was also studied, and it was shown that optimal seeding density helps to increase yield.

Phacelia (Phacelia tanacetifolia) is a plant that originally came from America, but is now successfully grown in many countries around the world, including Uzbekistan. Below is detailed information on its adaptation to the climatic and soil conditions of Uzbekistan.

Adaptation of Phacelia to the conditions of Uzbekistan:

- Phacelia is very resistant to warm and arid climates;
- Phacelia grows well in Uzbekistan, where summers are hot and spring and autumn are warm.
- Minimum germination temperature: +6...+8°C;

  Optimal growth temperature: +18...+25°C;
- Heat resistance: withstands up to +35°C, but flowering is reduced in high heat (especially in dry winds);
- Frost resistance: It can withstand short-term frosts down to -7°C. Therefore, it can be planted in early spring or autumn.
- Due to the limited water supply in Uzbekistan, phacelia grows well with drip irrigation or 2–3 additional irrigations.
- The first watering after planting helps seed germination.
- The second watering is when the leaves grow.

The third watering is before flowering.

It doesn't need to be watered too much — the plant is drought-tolerant.

Phacelia grows in almost all types of soil: sandy, muddy, saline, even rocky areas.

Best results: in fertile, air-permeable, neutral or slightly alkaline (pH 6.5–8) soils.

It grows without much difficulty even on saline soils, but the yield is slightly reduced. Phacelia is considered a soil-improving plant - it increases the structure and airiness of the soil with its roots, accumulates nitrogen. Sowing and care recommendations March-April or September-October (suitable for spring and autumn crops) Sowing depth 2-3 cm Seed rate 10-12 kg / ha Watering 2-3 times is enough. Fertilization If nitrogen fertilizers are applied in small quantities, the green mass increases. 5. Benefits Honey-rich in the conditions of Uzbekistan: very useful for beekeeping in the spring-summer period.

Green manure: enriches the soil with nitrogen, it is useful to plant before cotton, grain, vegetable crops. Suppresses weeds: phacelia grows quickly and prevents the emergence of other weeds. Anti-erosion: protects the soil from wind and water erosion in mountainous and sloping areas.

Regular and stable supply of agricultural crops throughout the season High yield production depends to a certain extent on the growth and development process in the plant.depends on the intensity of the process. The growth and development of plants are interdependent processes. They complement each other and positively influence each other. However, it cannot be said that growth and development mean the same thing.

Every continuous growth or development process leads to positive results. In some cases, when the growth rate exceeds the norm, the plant will wilt, It becomes difficult for light to reach the lower growth elements of the plant, resulting inThis situation delays the ripening of the crop.

Conversely, when development is too slow, the crop ripens relatively early. However, since the harvesting process takes place over a short period of time, the harvestThe weight is much lower. Therefore, it is desirable that all factors are at optimal levels to produce a high yield.

According to the experimental results, sowing phacelia in early spring (mid-March) accelerates the growth rate of the plant, starts flowering 5–7 days earlier, and increases yield. Early-sown phacelia plants effectively use optimal temperature (12–18 °C) and moisture conditions. Late sowing, due to high temperature and moisture deficiency, shortens the phenological stages of the plant, leading to a decrease in biomass. For example, according to Kovalchuk (2021), when phacelia was planted in May, the yield decreased by 22–27% compared to the early spring option.

Plant growth regulators are essential in the crop production process. By regulating the vegetative growth and reproductive growth of crops, it is necessary to obtain better quality and higher yields. Plant growth regulators are generally paclobutrazol, clofosbuvir, meplicot, chlizmpat, etc., which have been widely used on the market in recent years, and resolutions are also widely used.

The research was conducted in 2023–2024 in the conditions of the Republic of Uzbekistan, at an agricultural experimental site in the Samarkand region. The experiment was conducted in a completely randomized design with three replications.

The experiment options were structured as follows:

1. **Planting dates:**early spring (mid-March), mid-term (early April), late spring (late April);
2. **Seed standards:**6 kg/ha, 8 kg/ha, 10 kg/ha, 12 kg/ha.

According to the results of the experiment, the phenological stages of plants (germination, budding, flowering, fruit setting), vegetative mass growth, duration of the flowering period, nectar secretion rate and total yield indicators were determined. 10 plants were selected for each variant, and their growth dynamics were monitored through morphometric measurements. Soil moisture and temperature indicators were regularly recorded using agrotechnical measuring instruments.

Phacelia goes through the following main phenological stages during its growth:

- **Germination stage–**Shoots appear 7–10 days after sowing the seeds.

- **Leaf formation stage**– It lasts 10–15 days, during which time the plant needs nutrients.
- **Stem elongation stage** – 15–20 days, during which the plant height increases rapidly.
- **Flowering stage**– Lasting 10–15 days, it is the most important period for beekeeping.
- **Seed maturation stage**– 20–25 days after flowering, the seeds fully ripen.
- Changing the planting date has a significant impact on the duration and rate of progression of these stages.

Phacelia is not a very demanding plant for soil, but it grows well on soft, air-permeable, moderately moist and fertile soils. The most suitable soil types are irrigated gray soils, loams and light loams. It also grows well in a neutral environment with a pH of 6.0–7.5. It is difficult to germinate in very saline or heavy clay soils.

The tasks of the crop cultivation technology section of plant science include the introduction of scientifically based crop rotations for normal plant growth and development, high yield formation, the placement of crops after the best predecessor, the creation of optimal water-air and nutritional regimes for good development of the root system during soil cultivation, the effective use of organic fertilizers, the use of integrated (harmonized) methods in the fight against weeds, diseases and pests. The use of seeds that meet the requirements of state standards (sizes) for sowing, the optimization of sowing dates, norms, and depth, the creation of the most optimal irrigation regime for the plant during its growth period, the planting of varieties and hybrids included in the State Register or promising, the study of issues of timely and high-quality implementation of preliminary processing and storage measures.

Since Phacelia seeds are small, they cannot be planted too deep. The optimal planting depth should be around 1.5–2.5 cm. If planted too deep, germination will be delayed or completely reduced.

Planting methods can be as follows:

Row spacing (15–30 cm)— high seed efficiency, easy maintenance;

Planting in a closed (layered) method— used in areas intended for green mass production;

Planting as a mixed crop— protects the soil better when planted in a mixture with rye, oats, oats + peas.

Phacelia is not only a high biomass yielder, but also an agroecologically beneficial plant. It is of great importance in the following areas:

- **Increases soil fertility**— enhances the activity of microorganisms that fix nitrogen through their roots;
- **As a siderate**When used, it increases the amount of organic matter in the soil by 20–25%;
- **Beekeeping resource**It allows you to get up to 300–400 kg of honey from every 1 hectare of land;
- **Erosion protection**It serves a function - it covers the soil surface and protects it from the effects of wind and water;
- **Replanting (intercropping)**When used as a mulch between grain or vegetable crops, it retains moisture in the soil.

Agricultural crop production technology is a set of agrotechnical measures that ensure the production of high-quality, low-cost, environmentally friendly products, which are consistent with the biological characteristics of crops and soil and climatic conditions. Crop production technology is the main and technological measures for pre-sowing soil preparation, fertilization, seed preparation for sowing, sowing, crop care, and harvesting are carried out for all crops. There are specific features in the cultivation of certain crops, which include inoculation of leguminous seeds and soaking the stems of fiber crops in water.

One of the main directions of field crop cultivation technology is to fully utilize the achievements of scientific and technical progress in agriculture, the biological potential of crops, varieties, and hybrids, and to increase crop productivity and the amount of products grown by controlling the growth and development of plants.

In general, the most effective agrotechnical method is to sow phacelia in early spring at a seed rate of 10–12 kg/ha. These results allow for the widespread introduction of phacelia as an intercrop in the climatic conditions of Uzbekistan, and its use in beekeeping and organic farming systems.

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