



## OPPORTUNITIES FOR CULTIVATION OF WILD FLAX - *CAMELINA SATIVA* (L.) CRANTZ IN THE PRILEP PRODUCTION REGION

### МОЖНОСТИ ЗА ОДГЛЕДУВАЊЕ НА ДИВ ЛЕН - *CAMELINA SATIVA* (L.) CRANTZ ВО ПРИЛЕПСКИОТ ПРОИЗВОДЕН РЕГИОН

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**Abstract:** *Camelina sativa* (L.) Crantz, is an oil-bearing crop of the Brassicaceae family. It is used for the production of biofuels, biolubricants, feed for domestic animals and fish, the cosmetic and pharmaceutical industries. Two varieties ("NS Zlatka" and "NS Slatka"), produced at the State Institute of Field and Vegetable Crops in Novi Sad, Republic of Serbia, were used in the research. The two varieties of wild flax grown in the Prilep production area are characterized with good morphological properties and an average grain yield of 1348 kg/ha for "NS Zlatka" and 1204 kg/ha for "NS Slatka".

**Key words:** wild flax, varieties, morphological properties, yield

**Анстракт:** *Camelina sativa* (L.) Crantz, е маслодајна култура од семејството Brassicaceae. Се користи за производство на биогорива, биолубриканти, добиточна храна за домашни животни и риби, козметичката и фармацевтската индустрија. Во истражувањето се користени две сорти („НС Златка“ и „НС Слатка“), произведени во Државниот институт за полски и градинарски култури во Нови Сад, Република Србија. Двете сорти див лен што се одгледуваат во прилепското производно подрачје се карактеризираат со добри морфолошки својства и просечен принос на зрно од 1348 kg/ha за „НС Златка“ и 1204 kg/ha за „НС Слатка“.

**Клучни зборови:** див лен, сорти, морфолошки својства, принос

## 1. INTRODUCTION

One of the less represented oil plant species is wild flax - *Camelina sativa* (L.) Crantz, which is often recognized as a cultivated plant that can be one of the main candidates for the future European bioeconomy, mainly due to its unique favorable composition of the high content of polyunsaturated fatty acids. Wild or also known as false flax *Camelina sativa* (L.) Crantz, is an annual, self-fertile, oil-bearing plant belonging to the Brassicaceae family (Berti et al., 2016). The word *camelina* comes from the Greek word *chamai*, which means short, dwarf, and the word *linion*, which means flax (Cvejić et al., 2016). The products obtained from this plant have been

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used since ancient times in the food, in cosmetic industry for skin care products, soaps, and soft detergents (Ehrensing and Guy 2008), alternative and veterinary medicine, as well as for the production of biofuels and biolubricants (Zubr, 1997). Interest in this crop has increased in recent years due to the possibility of cultivation as a second crop, the short vegetation period 85-100 days from emergence to harvest (Gehringer et al., 2006; Marjanović Jeromela et al., 2021; Kuzmanović et al., 2021), the ability to adapt and grow in stressful conditions, the modest requirements for cultivation on less fertile soils with reduced fertilization and irrigation (Moser 2010; Putnam et al. 1993; Yuan and Li 2020; Zubr 1997), the relatively high seed yield and oil content in it (Gugel and Falk 2006; Krohn and Fripp 2012). This plant species also helps the ecosystem by absorbing plant nutrients in the root system and preventing their loss, then serving as a foraging environment for bees and contributing to reduced weed occurrence due to the dense seeding pattern (Berti et al. 2016, 2017; Eberle et al., 2015; Gesch and Cermak 2011). Wild flax is well suited for production in temperate climates (Cvejić et al., 2016).

*Camelina sativa* (L.) Crantz is an annual plant species with a spindle-shaped root, which is deep and does not impoverish the soil in terms of moisture. The stem is branched, mostly herbaceous, although it may become woody at maturity. The leaves are arrow-shaped. They are sharp, stationary, 5-10 cm long with smooth edges. The flowers are small with a pale yellow or greenish-yellow color and have 4 petals. Flax belongs to self-fertilizing plant species. The fruit is a pear-shaped shell containing the seed. The seeds are small, mostly yellow, oblong and characterized by an uneven surface. The mass of 1000 flax seeds is about 2-3 g (Marjanović-Jeromela et al., 2016).

In our country, this culture is not yet grown and there are no literary data from official research about it. Keeping this in mind, we set ourselves the goal of performing investigations on some important morphological properties of two introduced varieties of *Camelina sativa* (L.) Crantz in the Prilep production region.

The results of this research helped us to determine the most important morphological characteristics and the average seed yield of the two Novi Sad *camelina* varieties and the tendency for its spread and cultivation in the territory of the Republic of North Macedonia

## 2. MATERIALS AND METHODS

The research experiment on the wild flax *Camelina sativa* (L.) Crantz was placed on a colluvial-deluvial soil type with a low content of humus and nitrogen and medium availability of phosphorus and potassium. In the experiments, two genotypes of Serbian selection NS Zlatka and NS Slatka, which were created in the Republic of Serbia – Institute of Field and Vegetable Crops in Novi Sad (Marjanović-Jeromela et al. 2016), were tested. The experiment was set up in a randomized block system in three repetitions on the surfaces of the JNU Tobacco Institute - Prilep with coordinates N 41° 22, 135', E 021°30, 707' and an altitude of 677 m. The dimension of the basic plot was 10 m<sup>2</sup>, with 8 rows in the plot and an inter-row distance of 0.25 m. All necessary agrotechnical measures and adequate amount of fertilizer were fully applied to manifest the highest genetic potential of the varieties. Autumn basic tillage was carried out at a depth of 0.25 m, and during the vegetation the crop was fed with KAN (+/-27%) at 42 g per row. Sowing was done on April 8, while harvesting on July 8. Harvesting was done at full maturity, manually, by pulling out whole plants with the root, with separate bunches formed on the plot itself for each replicate). During the 90-day vegetation period, total precipitation of 80 mm and an average daily temperature of about 19°C were recorded in the Prilep production region. The following important parameters were analyzed in this paper: plant height, root length, number of branches per plant, number of pods per plant, average number of plants per m<sup>2</sup> and average seed yield per unit area.

### 3. RESULTS AND DISCUSSION

One of the first morphological characteristics examined was the height of the above-ground part of the plant, which represents the distance from the base of the stem at ground level to its top. The optimal height ensures greater resistance of the plants to lodging, and therefore a higher and more stable yield. In the NS Zlatka variety, the maximum height of the stem was 110 cm, in the three repetitions, while the minimum height was 80 cm. The Novi Sad variety NS Slatka, on the other hand, was distinguished by a maximum height of 101 cm, and a minimum height of 81.5 cm. According to the obtained results, it can be noted that the average height of the variety NS Zlatka is distinguished by a higher height, which on average is 94.45 cm, while the Novi Sad variety NS Slatka is distinguished by a lower stem by 0.86 cm, 93.58 cm.

Table 1. Descriptive s for plant height of used Camelina’s varieties: mean, maximum value (max), minimum value (min) and average of three repetition

Researched varieties	<i>Min</i>	<i>Max</i>	<i>Average of three repetitions</i>
NS Zlatka	80 cm	110 cm	94,45 cm
NS Slatka	81,5 cm	101 cm	93,58 cm

The stems of the camellia can be more or less branched depending on the variety and the density of sowing. A second morphological characteristic examined is the number of primary lateral branches originating from the main plant stem. The average number of lateral branches at the variety NS Zlatka from the three repetitions was 7. The variety NS Slatka was also characterized by a maximum average number of 7 branches. According to this morphological characteristic, it can be noted that there are no differences in the number of lateral branches between the two studied varieties.

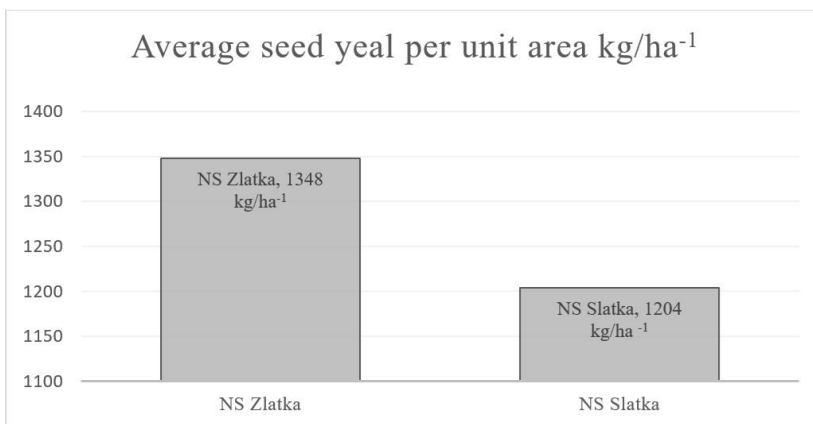


Figure 1. Number of lateral brunches at NS Zlatka and NS Slatka variety

One of the more important indicators that reflect the productivity of *Camelina sativa* is the number of pods per plant. Depending on the physiology of the plants and the conditions for growth and development, the number of pods in the examined cultivars NS Zlatka and NS Slatka varies from 100 to 300. In the research where the number of pods per plant was manually counted, a maximum number of 289 pods was recorded in both varieties. The average number of pods counted in the variety NS Zlatka was 184, which is 20 pods richer than the variety NS Slatka, which has an average of 164 pods per plant.

The average number of plants per unit area is one of the most significant elements of yield. This property is directly dependent on climatic factors and available moisture during vegetation. The sown seed was tested in the laboratory and was determined that it was characterized by 80% germination. From the obtained results, it can be noted that the variety NS Slatka is distinguished by an average number of 7,014,000 plants per ha<sup>-1</sup>, while the variety NS Zlatka has 787,000 less plants, which means 6,277,200 plants per ha<sup>-1</sup> for this variety.

The yield is the most relevant indicator of the success of growing *Camelina sativa* (L.) Crantz in our conditions. The obtained yield depends primarily on the genetic characteristics of the variety, on its adaptation to soil and climatic conditions and on the applied agrotechnical measures. According to research done in the Prilep region, there is no significant difference in seed yield between the two studied varieties. From figure 1, it can be concluded from the calculations that the variety NS Zlatka, as the highest variety, gives the highest seed yield, which is about 1348 kg/ha<sup>-1</sup>, while the second variety NS Slatka, is distinguished by a significant seed yield, which is 1204 kg/ha<sup>-1</sup>.



Graph 1. Average seed yield per unit area kg/ha<sup>-1</sup> of two varieties of *Camelina sativa* (L.) Crantz, (NS Zlatka and NS Slatka) in the Prilep region.

#### 4. CONCLUSION

*Camelina sativa* (L.) Crantz is an oil-bearing plant with a short vegetation period of 85 – 100 days. Wild flax is a culture that has high environmental adaptability, quickly absorbs water and nutrients from the soil, has little need for mineral and organic fertilizers and is characterized by good tolerance to pests and diseases. Plant height is a significant morphological characteristic that plays a key role in the production of a plant with high lodging and breakage resistance and a high harvest index. In view of the presented morphological characteristics of the investigated varieties of *Camelina sativa* (L.) Crantz, it can be concluded that these varieties are quite adaptable to our climatic conditions and there are no major deviations in terms of the average seed yield. Also, there are several necessary prerequisites for the introduction of this plant species into production, such as: enrichment of collections with new genotypes of wild flax, higher

location and more years of practical research in order to assess agronomic and quality properties, crossing in selected varieties for optimal sorting and creating genotypes (Marjanović Jeromela et al., 2022). The obtained results of this research can greatly help for the introduction, testing and development of other more profitable and profitable varieties of this oil-bearing crop in different regions of R. North Macedonia.

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