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INFLUENCE OF THE NON-WOVEN COVER CLOTH – AGRIL ON THE DEVELOPMENT OF SPRING CABBAGE IN THE OPEN FIELD

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ABSTRACT

Cabbage (Brassica oleracea var. Capitata L.) is a very important garden crop. In Macedonia, cabbage is grown on significantly large areas, both in protected areas and in open fields. Producers are looking for new alternative ways and opportunities to increase production with cabbage in the open field with earlier sowing dates, but due to low temperatures, new opportunities are being sought to solve this problem.

With the use of agril in the production of early spring cabbage in the open field, the vegetation period on the KEVIN F1 hybrid was shortened by 12 days in the first year and 10 days in the second year compared to the control. The area covered with agril gave a higher yield compared to the control.

Key words: *cabbage, temperature, vegetation, period, yield, cover, agril*

Introduction

Cabbage (Brassica oleracea var. capitata L.) is a highly significant horticultural plant. It is a biennial dicotyledonous plant that has been cultivated for over 2,500 years.

It differentiates into:

-White-headed cabbage (Brassica oleracea var. capitata forma alba)

-Red-headed cabbage (Brassica oleracea var. capitata forma rubra) and

- Purple-headed cabbage (Brassica oleracea var. capitata forma semirubra)

The heads of the different forms, varieties, and hybrids mostly weigh between 0.5 to 5 kilograms. Cabbage is a head leafy vegetable mostly used fresh as salad and juice, as a cooked dish, for pickling, marinating, drying, or freezing, allowing its use throughout the year. Cabbage has a high content of dry matter, especially proteins and sugars, monosaccharides, with an energy value of 106 kJ. It is rich in vitamin C, and it also contains a lot of iron, calcium, and potassium. Worldwide, it is cultivated on approximately 3,200,000 hectares with an average yield of 16.2 t/ha. Cabbage area in Macedonia: 1,196 ha. The total annual production of horticultural crops in Macedonia is about 800 000 tons. World production: Africa: 1 648 000 ha, USA: 911 000 ha, Europe: 276 000 ha, Russia: 180 000 ha, Asia: 42 000 ha. Under certain conditions, cabbage, as a biennial plant, can flower in the first year, resulting in the absence of head formation used for nutrition. This happens if it's sown early, has delayed planting, exposure to low temperatures, and unfavorable weather conditions throughout the growth period, as well as in locations with longer daylight hours, etc.

Based on the duration of vernalization, all types and forms of cabbage are divided into 5 groups: -With a distinctly short vernalization stage, -With a short vernalization stage, -Medium-length vernalization stage - Long vernalization stage, and Very long vernalization stage

According to the length of the vegetation period, cabbage varieties are divided into:

- Early (100-115 days),
- Mid-early (115-125 days), and
- Late varieties (over 150 days).

Growing Conditions Cabbage has moderate temperature requirements. Specifically: The optimal temperature for germination, flowering, and fruit formation is 18-20°C. The optimal temperature for vegetative organ growth is 15-18°C. Temperatures above 25°C slow down growth and result in loose and soft heads forming. In the rosette development phase, it can withstand up to -15°C, but during head formation, it can only withstand brief frosts. Vernalization in cabbage can occur under certain circumstances, even during seedling production. Then, flowering occurs in the first year, leading to significant yield losses. Cabbage is a long-day plant and has moderate light requirements, but shaded areas reduce both quality and quantity. Water requirements are significant, especially during intensive rosette growth and the beginning of head formation. The optimal humidity for early varieties is 60–70% of FC, and for later varieties, it's 60-80%. Cabbage is successfully grown in moist, light, medium, and heavy soils with good structure and high nutrient content.

Cabbage 2023/24	Without AGRIL	With AGRIL	Difference
Length of Vegetation (number of days)			
2023	92	80	12
2024	90	80	10
Head Weight (kg)			
2023	1.13	1.32	0.19
2024	1.21	1.31	0.10
Yield per unit area (t/ha)			
2023	31.6	37.0	5.4
2024	32.9	37.8	4.7
Cabbage Production Cost at Harvest (den/kg)			
2023			
2024	10	25	15
	6	10	4

Materials and Methods

The main goal of this experiment was to determine the possibility of using and the influence of covering canvas - agril on the development of spring cabbage in open field conditions. The experiments were conducted in the field of the village of Robovo, Bosilovo, on cadastral parcel number 1082. The experiments were carried out during the production year 2022/23. The cabbage was sown in a semi-warm bed. The sowing date was December 11, 2022. Germination occurred 7 days after sowing. For this experiment, the KEVIN F1 hybrid was used, which is a mid-early hybrid of spring cabbage. Before planting the cabbage, the surface preparation was carried out. Autumn deep plowing was performed on the surface, and before planting, granular artificial fertilizer NPK 16:16:16 was added to the surface at a rate of 600 kg/ha. Then, the surface was prepared with a rototiller, resulting in a soft soil layer for planting. Before planting, the surface was treated with the herbicide STOMP 330 EC to control weeds. The planting of the cabbage was on February 10, 2023. Planting was done using a three-row planting machine, with 70 cm between-row spacing and 40 cm within-row spacing. After planting, it was covered with thin, breathable, and water-permeable cloths - agril. A part of the surface remained uncovered and served as a standard control. The agril was removed from the crop after the formation of the leaf rosette, in April.

Characteristics of the Kevin F1 Hybrid from Syngenta Early varieties thrive best in loose, sandy loam soils. Kevin F1 is suitable for cultivation in tunnels and open fields with or without agrotextile. It has upright leaves and a transparent rosette, forming strong, uniform heads. With proper cultivation techniques, it exhibits satisfactory resistance to splitting and bolting. It is exclusively intended for fresh consumption, boasting excellent taste and an attractive appearance.

Characteristics of AGRIL - non-woven material for protection against frost and hail in agriculture

- Model: SW-AGPF005
- Brand: SINVIN
- Weight: 40-100 g/cm
- Use: for agriculture, covering with non-woven material for protection against frost and hail on plants
- Good air permeability & water penetration
- Recyclable
- Partially resistant to stretching and elongation
- Non-woven, production technique: spunbond
- Material: 100% polypropylene
- Color: white, size: customizable
- Packaging: in rolls
- Price: 8.5 denars/m²

Month	Maximum temperatures (°C)	Minimum temperatures (°C)	Average Monthly Temperatures temperatures (°C)	Precipitation (litars/m²)
Feruary	12.6	-2.3	3.8	21.7
March	16.3	2.7	9.5	43.9
April	18.2	5.0	11.2	91.4
May	22.7	10.09	16.4	75.5
June	28.7	14.9	21.5	/

Cabbage 2023/24	Without AGRIL	With AGRIL	Difference
Sowing Date			
2023	11.12.2022	11.12.2022	/
2024	09.12.2023	09.12.2023	
Germination			
2023	18.12.2022	18.12.2022	/
2024	17.12.2023	17.12.2023	
Transplanting			
2023	20.02.2023	20.02.2023	/
2024	22.02.2023	22.02.2023	
Harvest			
2023	22.05.2023	09.05.2023	12 days
2024	20.05.2023	10.05.2023	10 days

Conclusions

From the above, the following important conclusions and observations can be drawn:

Cabbage (Brassica oleracea var. capitata L.) is a highly significant horticultural crop.

It has a high content of dry matter, especially proteins and sugars - monosaccharides, with an energy value of 106 kJ.

In Macedonia, cabbage is cultivated on significantly large areas, both under protective cover and in open fields.

Producers are seeking new alternative methods and opportunities to increase cabbage production in open fields but with earlier planting and harvesting deadlines.

By using AGRIL in the production of early spring cabbage in open fields, the vegetation period is shortened by 11 days compared to the control in the two years of testing.

AGRIL-covered areas yielded higher cabbage production by 5.05 t/ha compared to the control.

The economic gain from using AGRIL is increased yield per unit area and the difference in market price at the time of harvest.

One of the options contributing to achieving earlier production of fresh cabbage from open fields in early spring is the use of protective non-woven fabric - AGRIL.

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