EFFECT OF PLANTING TIME ON SUNFLOWER HYBRID GROWTH

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Abstract

Our experiment, set up at the Látókép AGTC MÉK research area of the University of Debrecen, focused on studying the effects of planting time on the growth of sunflower hybrids of two different genotypes (NK Neoma, SY Revelio) under different fungicide treatments in 2012. During our research, early sown plants produced the largest leaf area in the case of both treatments and hybrids (control: NK Neoma: 4.7 m^2/m^2, SY Revelio: 5.3 m^2/m^2; double-treated: NK Neoma: 4.9 m^2/m^2, SY Revelio: 5.3 m^2/m^2). For both treatments, maximum leaf coverage was measured on 2 July, 2013 in the case of early sown hybrids and on 23 July, 2013 in the case of late sown ones. As for hybrids sown in average planting times, maximum leaf coverage was measured on 2 July, 2013 in the case of the control parcels and on 23 July, 2013 in the case of the double-treated ones. Two-time fungicide treatments lead to the conservation of the green leaf area in the case of hybrid SY Revelio. By postponing the planting time in the control parcels, maximum plant height fell in the case of both hybrids. On the other hand, in the case of double-treated hybrids, the largest plant height (182 cm) was measured at late planting for NK Neoma and at average planting time for SY Revelio (197 cm).

Key words: sunflower, planting time, plant heigth, fungicid protection.

INTRODUCTION

After cereals oilseeds are the second largest field crop group in the world (Mijic et al., 2012). Hungarian crop production is mainly based on cereal production. However, besides cereal crops, industrial crops that act as intensification cultures – mostly oil crops – also play a major part (Pepó et al., 2002). Among oil seeds in Hungary sunflower is most frequently grown (550,000 ha) (Mijic et al., 2012). In domestic sunflower production proper hybrid selection, seeding technology (planting time, plant density) and plant protection are crucial cultivation techniques (Zsombik, 2006). Proper selection of the right cultivation technique (planting time, plant density) is also vital when considering stock development, flowering biology, nutrient utilization, infection dynamics, weed control and ripening biology aspects (Kozmáné, 2012). Optimal planting time directly (Zsombik, 2007) and significantly (Allam et al., 2003) affects plant development. Planting applied too early or too late compared to the optimum are both unfavourable for the vegetative and generative development of the sunflower (Pepó, 2012).

MATERIAL AND METHOD

The research was set up on chernozem soil with lime patches at the Látókép AGTC MÉK research area of the University of Debrecen. The research area is located in Eastern-Hungary, 15 km far from Debrecen, on the area of the aeolain loess of the Hajdúság. Soil of the research area is of good agricultural condition, medium hard and loamy with medium humus content and neutrality. Water supplies of the soil are favorable and it has good water retention and conductivity.

We examined the effects of planting time on the growth of sunflower hybrids of two different genotypes (NK Neoma, SY Revelio) under different fungicide treatments in 2012. Hybrid NK Neoma is an imidazolin resistant, traditional oil sunflower while, SY Revelio is hybrid with a high oleic acid content. Parcells of the research were set up in four repetitions. Previous crops were maize. The sowing times are recorded in Table 1. The number of seedlings at the time of sowing was 95,000 ha^{-1} and was later optimized to a plant density of 55,000 ha^{-1}. Plants received uniform agrotechnical treatments applied generally in practice. Two different levels of fungicide treatments were used. Besides the control stand (no treatment applied) we set up a double-treated one for which we used fungicide Pictor (substances: boscalid and dimoxistrobin) in a dose of 0.5 l ha^{-1} two times (at the time of the 8-10-leaf stages and blooming). The dates of harvesting are also in Table 1, harvesting was made with a Sampo parcel harvester, installed with a special adapter. Plant height was recorded in four repetitions. While recording the results, five plants of different maturity status were selected in each parcel. Plant height was determined every 10^{th} day during the growing year all the way to the end of the flowering period. LAI was measured four times with a mobile SunCanopy Analysis System (SS1).

Table 1

Applied planting times and harvesting times
(Debrecen, 2013)

	Early planting time	Average planting time	Late planting time
Planting time	10 April, 2013.	25 April, 2013.	8 May, 2013.
Harvesting time	9 September, 2013.	9 September, 2013.	29 September, 2013.

2013 weather conditions significantly challenged the adaptation capability of sunflower hybrids. April and May weather conditions – apart from some short periods – were ideal for the vegetative development of stocks. Sunflower plants with excellent stages of development and significant vegetative sink were able to tolerate the dry (June: 30.8 mm,

July: 15.6 mm, August: 32.2 mm) and hot (June: 19.6 °C, July: 21.2 °C, August: 21.5 °C) period from the middle of June till the end of August. The flowering and fertilization of stocks as well as the development and filling of achenes were sufficient. Smaller, but continuous rainfalls prior to the harvesting period set the stock back from drying and hindered harvest (Table 2).

Table 2

The amount of rainfall and temperature during the investigated crop-year (Debrecen, 2013)

Precipitation (mm)								
Months	March	April	May	June	July	August	September	Tottaly/ Average
30 year's average	33.5	42.4	58.8	79.5	65.7	60.7	38.0	378.6
2013	136.3	48.0	68.7	30.8	15.6	32.2	47.6	379.2
Difference	102.8	5.6	9.9	-48.7	-50.1	-28.5	9.6	0.6
Temperature (°C)								
30 year's average	5.0	10.7	15.8	18.7	20.3	19.6	15.8	15.1
2013	2.9	12.0	16.6	19.6	21.2	21.5	14.0	15.4
Difference	-2.1	1.3	0.8	0.9	0.9	1.9	-1.8	0.3

RESULTS AND DISCUSSION

We determined the leaf area per 1m^2 by using a leaf area indicator and illustrated its dynamics as shown in Figure 1. Maximum leaf coverage in the control parcels were recorded at the same time both in the case of early and late planting times (2 July, 2013) for both hybrids. For late sown stands both NK Neoma and SY Revelio reached maximum leaf coverage on 23 July, 2013. On the contrary, in the case of parcels with a two-time fungicide treatment, largest LAI results were recorded on 2 July, 2013 for the early sown stands and on 23 July, 2013 for the average and late sown stands.

Early sown plants reached the largest leaf area in the case of both treatments and hybrids (control: NK Neoma: 4.7 m^2/m^2, SY Revelio: 5.3 m^2/m^2; double-treated: NK Neoma: 4.9 m^2/m^2, SY Revelio: 5.3 m^2/m^2). Leaf area of average sown stocks only slightly lagged behind the results of the early sown ones for both hybrids in the control parcels (NK Neoma: early planting time: 4.7 m^2/m^2 average planting time: 4.5 m^2/m^2; SY Revelio: 5.3 m^2/m^2, average planting time: 4.9 m^2/m^2). However, leaf area records of late sown stocks significantly fell compared to the results of the ones with early and average planting times (NK Neoma: 3.9 m^2/m^2, SY Revelio: 3.9 m^2/m^2).

These results are also underpinned by the fact that, in the case of all three planting times, leaf area records were lower at the end of August as they were in the double-treated parcels. Furthermore, while leaf area results measured at the control parcels were almost the same in the case of all the three planting times (early: 0.7 m^2/m^2, average: 0.6 m^2/m^2, late: 0.7 m^2/m^2), the more early the planting time was in the double-treated stand, the lesser was the leaf area record (early: 0.9 m^2/m^2, average: 1.4 m^2/m^2, late: 2.0 m^2/m^2). As for hybrid NK Neoma, in the case of early and average planting times, leaf area measured in late August were almost even in the two treatments (control: early: 0.3 m^2/m^2, average: 0.4 m^2/m^2; double-treated: early: 0.2 m^2/m^2, average: 0.4 m^2/m^2). Considerable differences were recorded in the case of late sown stands (control: 0.9 m^2/m^2, double-treated: 1.3 m^2/m^2).

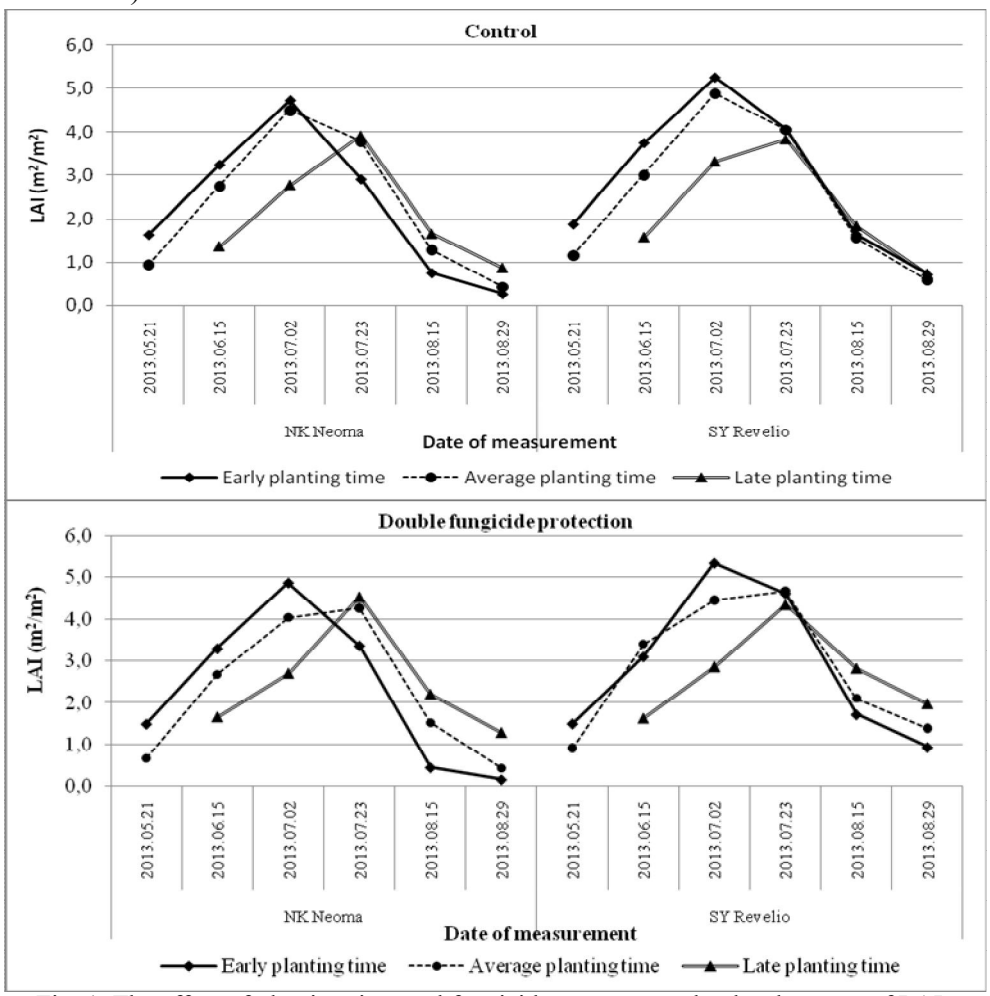

Fig. 1. The effect of planting time and fungicid treatment on the development of LAI-values of sunflower hybrids (Debrecen, 2013)

Plant height was measured seven times throughout the growing period (Figure 2.) By postponing the planting time in the control parcels, maximum plant height fell in the case of both hybrids. On the other hand, in the case of double-treated hybrids, the largest plant height (182 cm) was measured at late planting for NK Neoma and at average planting time for SY Revelio (197 cm). No significant differences were recorded for the growing dynamics neither in the case of the hybrids or the treatments.

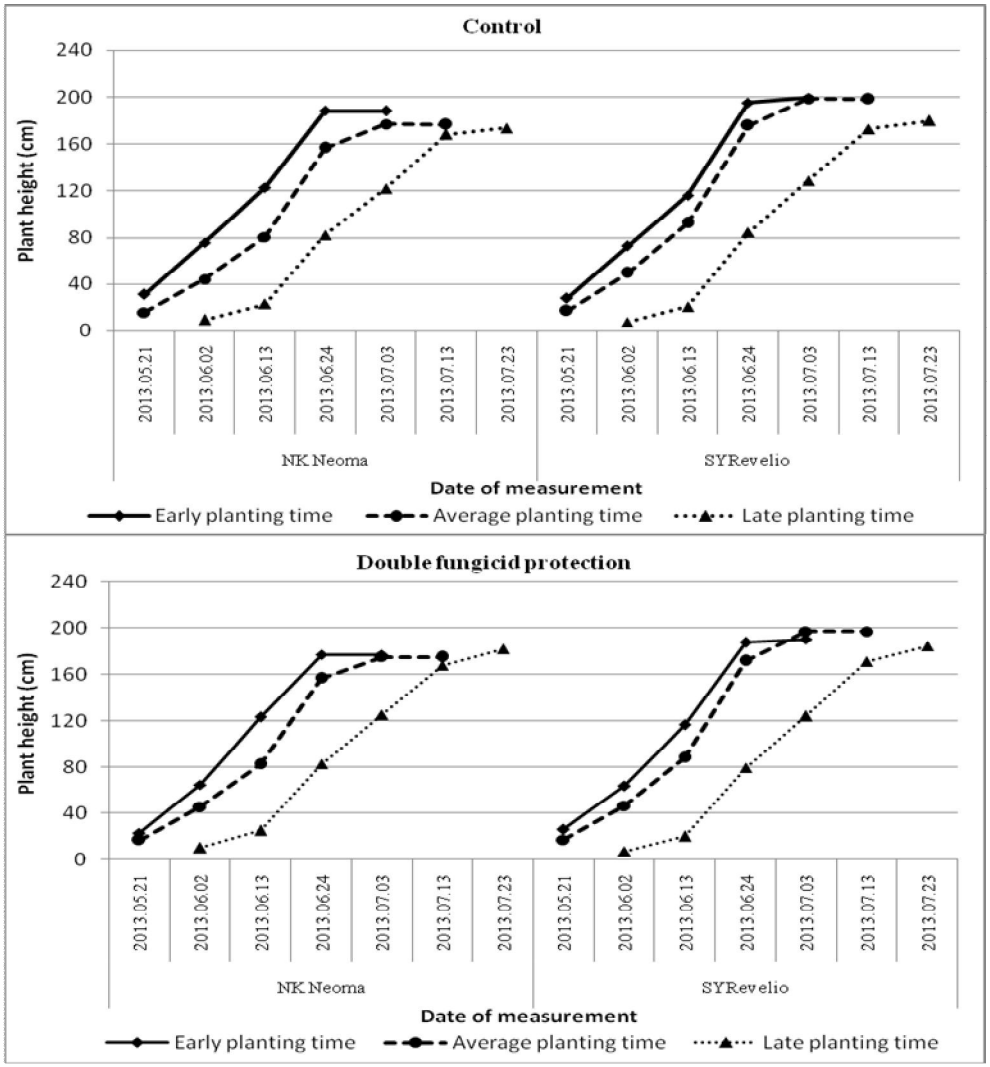

Fig. 2. The effect of planting time and fungicid treatment on the plant height of sunflower hybrids (Debrecen, 2013)

CONCLUSIONS

During our research, early sown plants produced the largest leaf area in the case of both treatments and hybrids (control: NK Neoma: 4.7 m^2/m^2, SY Revelio: 5.3 m^2/m^2; double-treated: NK Neoma: 4.9 m^2/m^2, SY Revelio: 5.3 m^2/m^2). For both treatments, maximum leaf coverage was measured on 2 July, 2013 in the case of early sown hybrids and on 23 July, 2013 in the case of late sown ones. As for hybrids sown in average planting times, maximum leaf coverage was measured on 2 July, 2013 in the case of the control parcels and on 23 July, 2013 in the case of the double-treated ones. Two-time fungicide treatments lead to the conservation of the green leaf area in the case of hybrid SY Revelio. By postponing the planting time in the control parcels, maximum plant height fell in the case of both hybrids. On the other hand, in the case of double-treated hybrids, the largest plant height (182 cm) was measured at late planting for NK Neoma and at average planting time for SY Revelio (197 cm).

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