

PLANT HEIGHT IN SOME PRILEP TOBACCO VARIETIES

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ABSTRACT

Height is distinctive morphological feature for each type and variety of tobacco. Investigations on this character were conducted in 2009 and 2010 in the Experimental field of Tobacco Institute Prilep with six oriental varieties of the type Prilep: Prilep P-23 (Ø), P 12-2/1, NS-72, P 66-9 /7, P-79-94 and Prilep Basma 82. The average values for the height of the stalk with inflorescence ranged from 59,3 cm in Prilep P 12-2/1 to 148,1 cm in Prilep Basma 82. Compared to the check, only in variety Prilep P 12-2/1 the stalk height is lower and in all other varieties it is higher.

Key words: Tobacco, type Prilep, P-23, P-12-2/1, NS-72, P 66-9/7, P-79-94, Prilep Basma 82, genotype

ВИСОЧИНА НА РАСТЕНИЈАТА КАЈ НЕКОИ СОРТИ ТУТУН ОД ТИПОТ ПРИЛЕП

Височината како морфолошко својство е карактеристика на секој тип и сорта на тутун. Истражувањата за ова својство се вршени во 2009 и 2010 година на опитното поле од Институтот за тутун Прилеп на шест ориенталски сорти од типот прилеп: прилеп П-23 (Ø), П 12-2/1, НС-72, 66-9/7, П-79-94 и прилеп басма 82. Просечните вредности за височината на стракот со соцветие се движат од 59,3 cm кај сортата прилеп П 12-2/1 до 148,1 cm кај прилеп басма 82. Во однос на контролата само сортата прилеп П 12-2/1 има пониско стебло, а сите останати истражувани сорти имаат повисоко стебло.

Клучни зборови: Тутун, тип прилеп, П-23, П-12-2/1, НС-72, П 66-9/7, П-79-94, прилеп басма 82

INTRODUCTION

Tobacco is a very “plastic” plant, which, depending on the growing conditions, can have large differences in morphological properties. Although these properties are considerably variable and greatly depend on external environmental conditions, it can be stated that plant height is a typical and varietal characteristics. Selectioners

make efforts to create a variety with higher number of leaves and stalk height in the limits that correspond to oriental tobaccos, i.e. they are trying to maintain their qualitative and quantitative characteristics which are of major importance both for tobacco growers and for purchasers.

MATERIAL AND METHODS

The following six varieties of the type Prilep served as material for comparative studies of stalk height: P-23 - Ø (check), P12-2/1, NS-72, P-66-9/7, P-79-94 and Basma-82 (Figures 1 - 6).

Field trial was set up in diluvial-colluvial soil in 2009 and 2010 in four replications, with one deep plowing (to 35 cm depth) in autumn and three plowings in spring. Fertilization was applied before the second spring plowing with

complex mineral fertilizer NPK 10:30:20 in amount of 300 kg / ha.

All necessary cultural practices were applied during the growing period of tobacco. In both years of investigation, nutrition with 27% KAN in amount of 60 kg/ha was made. Measurements of this morphological trait were performed according to usually applied methods in genetics and tobacco breeding.



Photo 1. Prilep P-23



Photo 2. Prilep P 12-2/1



Photo 3. Prilep NS-72



Photo 4. Prilep P-66-9/7



Photo 5. Prilep-79-9/4



Photo 6. Prilep Basma -82

CLIMATE CHARACTERISTICS

The mean monthly air temperature of 18.9°C in 2009 and 2010 during the growing period satisfies the requirements for obtaining a good quality tobacco raw.

Table 1 Climate characteristics

Meteorological factors	Year	Months					/Σ
		V	VI	VII	VIII	IX	
Mean monthly air temp., °C	2009	15.8	18.5	21.9	21.4	17.1	18.9
	2010	15.3	18.8	21.3	23.1	15.9	18.9
Precipitations, mm	2009	55.0	75.0	8.0	43.0	15.0	196.0
	2010	64.0	87.0	55.0	45.0	47.0	298.0

Distribution of rain during the growing period in 2009 (196 mm) was non-uniform and had a negative effect on tobacco yield and quality. To reduce this negative effect, irrigation appears as an indispensable practice. According to the data on amount (298 mm) and distribu-

tion of precipitation during the growing period in 2010, there were excessive rainfalls, but their distribution was non-uniform and did not meet the requirements of tobacco. Therefore, during draught periods it is necessary to apply irrigation.

RESULTS AND DISCUSSION

Tobacco height is type and varietal trait, which is affected by soil and climate conditions of the environment.

Uzunoski (1985) reported that tobacco height is quantitative trait which highly depends on variety and environmental conditions.

Stalk height was measured with and without inflorescence, because in some variet-

ies it is inverted in the top leaves and in others it is exerted.

Data presented in Table 2 show that in 2009 only the variety P 12-2/1 is lower compared to the check. This is the oldest tobacco variety with lower number of leaves and it is understandable why its height is lower.

Table 2. Height of the stalk with inflorescence in 2009 (cm)

Variety	Replication				Average	Index
	I	II	III	IV		
Prilep P-23 (Ø)	61.4	69.1	67.4	63.9	65.5	100.00
Prilep P 12-2/1	57.1	55.4	59.5	50.4	55.6	84.88
Prilep NS-72	88.0	85.8	83.6	96.4	88.5	135.11
Prilep P 66-9/7	104.0	112.0	110.0	98.2	106.1	161.98
Prilep P-79-94	94.6	92.8	93.6	81.1	90.5	138.16
Prilep Basma 82	146.0	142.6	146.6	134.0	142.3	217.25
Average	91.8	92.9	93.4	87.3	91.4	139.54

LSD 0.05 = 7.51 cm

0.01 = 10.31 cm

0.001 = 14.35 cm

Table 3. Height of the stalk with inflorescence in 2010 (cm)

Variety	Replication				Average	Index
	I	II	III	IV		
Prilep P-23 (Ø)	62.2	81.6	69.0	72.7	71.4	100.00
Prilep P 12-2/1	68.7	57.5	60.4	65.4	63.0	88.24
Prilep NS-72	95.9	103.0	88.4	124.0	102.8	143.98
Prilep P 66-9/7	114.0	123.0	116.0	121.0	118.5	165.97
Prilep P-79-94	101.1	107.0	109.0	96.0	103.3	144.68
Prilep Basma 82	153.0	154.0	157.0	152.0	154.0	215.69
Average	99.15	104.35	99.97	105.18	102.17	143.10

LSD 0.05 = 12.18 cm

0.01 = 16.85 cm

0.001 = 23.28 cm

In the check variety Prilep P-23, the average stalk height with inflorescence is 65.5 cm. Lower values for this trait (55.6 cm) were observed only in P 12-2/1 and all other varieties had higher stalk with inflorescence, ranging from 88.5 cm in NS-72, 90.5 cm in P-79-94, 106.1 cm in P 66-9/7 up to 142.3 cm in Prilep Basma-82.

Expressed in percentages, P 12-2/1 variety had 15.12% lower height compared to the check, while all other investigated varieties were higher. Thus, NS-72 was higher for 35.11%, P-79-94 for 38.16%, P 66-9/7 for 61.98% and

Basma 82 for 117.25% higher compared to the check.

Results from investigations carried out in 2010 (Table 3) were similar to those of 2009. Again, P 12-2/1 was the lowest and Basma 82 was the highest. The average height measured in the check variety P-23 was 71.4 cm and only the variety P 12-2/1 with a height of 63.0 cm was lower compared to it. The other tobacco varieties had higher stalk with inflorescence, ranging from 102.8 cm in variety NS-72, 103.3 cm in P-79-94, 118.5 cm in P 66-9/7 to 154.0 cm in Basma 82.

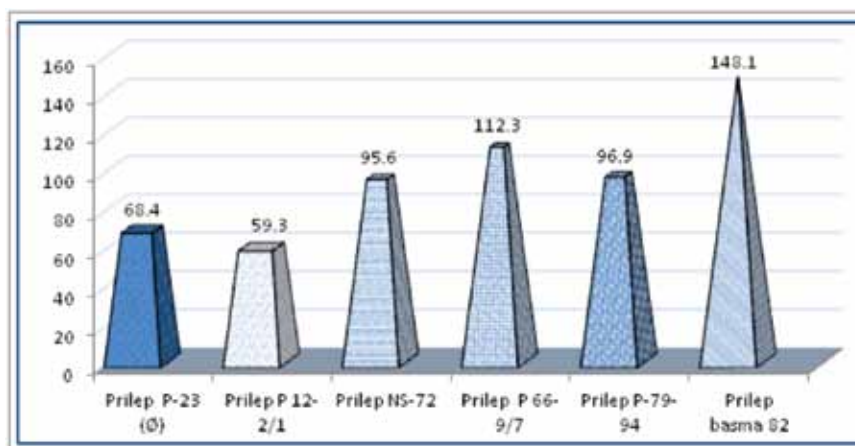


Figure 1 Average height of the stalk with inflorescence, cm (2009 – 2010)

Relative difference between the investigated varieties in relation to the check was negative only in variety P 12-21 (-11.76%) and in all other varieties it was positive for 43.98%, 44.68%, 65.97% and 115.69% in NS-72, P-79-94, P 66-9/7 and Basma 82, respectively.

Based on statistical data analysis for both years of investigations, it can be stated that all differences between varieties are highly significant at a level of 0.001, indicating that they are a product of the different genetic constitution.

From the presented data on the average two-year results for stalk height with inflorescence in analysed tobacco varieties (Figure 1), we can only confirm the statement that has been almost the same in 2009 and 2010. Tobacco control variety P-23 has an average height of 68.4 cm. The lowest stalk height of 59.3 cm was measured in P 12-2/1 and it is 13.31% lower compared to the check variety. Greater stalk height was found in variety NS-72 (95.6 cm, i.e. 39.77% higher). Somewhat lower height was observed in P-79-94 (96.9 cm, or 41.67% higher compared to the check). Greater average height of 112.3 cm (or 64.18% more) was observed in P 66-9/7 and the highest was variety Prilep Basma 82 with 148.10 cm, i.e. 116.52% higher than the check.

Beside stalk height with inflorescence, measurements were also made on stalk height without inflorescence, because the shape and size of the inflorescence can greatly differ, which has an impact on this character.

Our investigations on tobacco stalks without inflorescence carried out in 2009 (Table 4) gave similar results as for height of the stalks with inflorescence. The check variety had an average height of 59.0 cm and variety P 12-2/1 had 50 cm, i.e. 15.25% shorter. Higher stalk height was achieved in varieties NS-72 (80.9 cm), P-79-94 (82.7 cm, i.e. 40.17% higher than the check), P 66-9/7 (102.1 cm) and the highest was the stalk of Basma 82 variety with 131.7 cm, i.e. 132.22% more than the check.

Analysis of the results on stalk height without inflorescence obtained in 2010 (Table 5) show small differences compared to the year 2009. The check variety P-23 has an average height of 64.0 cm and only the variety P12-2/1 is lower than it, measuring 54.2 cm. Higher than the check are all other varieties: P-79-94 with 92.7 cm, NS-72 with 93.8 cm, P 66-9/7 with 108.5 cm and the highest was Prilep Basma 82 with 143.5 cm.

Table 4. Stalk height without inflorescence (cm), 2009

Variety	Replication				Average	Index
	I	II	III	IV		
Prilep P-23 (Ø)	55.9	61.0	60.1	58.8	59.0	100.00
Prilep P 12-2/1	50.6	50.5	54.5	44.3	50.0	84.75
Prilep NS-72	81.1	77.6	76.3	88.4	80.9	137.12
Prilep P 66-9/7	95.8	104.4	101.5	91.6	102.1	173.05
Prilep P-79-94	87.6	83.6	86.9	73.2	82.7	140.17
Prilep Basma 82	134.4	132.6	136.0	123.6	131.7	232.22
Average	84.2	84.9	85.9	80.0	84.4	143.05

LSD 0.05 = 7.36 cm
 0.01 = 10.17 cm
 0.001 = 14.05 cm

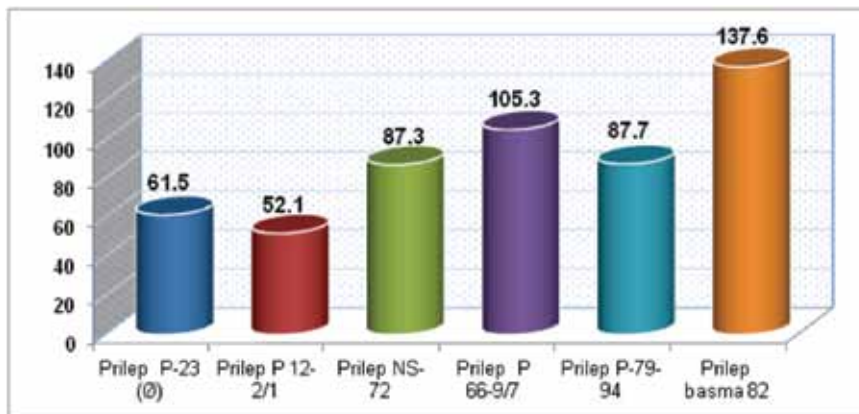
Table 5. Stalk height without inflorescence (cm), 2010

Variety	Replication				Average	Index
	I	II	III	IV		
Prilep P-23 (Ø)	56.3	74.9	60.4	64.5	64.0	100.00
Prilep P 12-2/1	60.3	48.1	52.8	55.6	54.2	84.69
Prilep NS-72	87.2	93.6	81.1	113.1	93.8	146.56
Prilep P 66-9/7	104.0	112.9	106.0	111.0	108.5	169.53
Prilep P-79-94	90.6	95.0	99.0	86.0	92.7	144.84
Prilep Basma 82	143.0	143.0	146.0	142.0	143.5	224.22
Average	90.23	94.58	90.88	95.37	92.78	145.00

LSD 0.05 = 11.67 cm
 0.01 = 16.13 cm
 0.001 = 22.29 cm

Statistical data processing on stalk height without inflorescence in 2009 and 2010 confirms that differences are highly statistically significant,

i.e., that each of the investigated tobacco varieties is unique and has its own genetic code.

**Figure 2. Average stalk height without inflorescence in cm (2009-2010)**

According to the average height for the two investigated years (Figure 2), it can be noted that the check variety has an average height of 61.5 cm and that only the variety P 12-2/1 has a shorter stalk - 52.1 cm, which is 15:29% lower. Higher stalks compared to the check were measured in varieties Prilep NS-72 with 87.3 cm (41.95% higher), P-79-94 with 87.7 cm (42.60% higher), P 66-9 / 7 with 105.3 cm (71.22% higher) and the highest was Prilep Basma 82 with 137.6 cm (123.74% higher).

The height of Prilep tobacco varieties was studied by a number of authors. Our data are in correlation with their results.

Odic (1973) reported that the average height of tobacco type Prilep average was 83 cm. Uzunoski (1985) found that Prilep tobacco is the lowest of all other types, with an average height of 40 to 50 cm.

According to Dimitrieski (1985), the

height of Prilep tobacco variety P 12-2/1 is 45.5 cm. Dimitrieski (2001), in his investigations of several varieties of the type Prilep in conditions of irrigation, came to the following data: variety P12-2/1 with inflorescence is 46 cm high, variety P-23 reached a height of 57 cm, while Prilep NS-72 had a stalk height of 74 cm.

Korubin-Aleksoska (2004) reports the following average stalk heights: P-23 - 65 cm, P 12-2/1 - 55cm and P-79-94 - 70 cm.

Dimitrieski (2011), in his investigations on variety P-66-9/7 suggested that under normal conditions for growth, plant height ranges from 65 to 75 cm.

From previously presented data on the height of the stalk with and without inflorescence, a general conclusion can be drawn that the differences between investigated tobacco varieties are significant and that they are primarily a result of the genotype.

CONCLUSIONS

Based on the two-year investigations on plant height in some varieties of tobacco type Prilep, the following conclusions can be drawn:

Height of the stalk with inflorescence in the check variety Prilep P-23 was 68.4 cm. The lowest stalk height (59.3 cm) was measured in variety Prilep P 12-2/1. Higher stalks compared to the check were recorded in varieties Prilep NA-72 with 95.6 cm, Prilep P-79-94 with 96.9 cm, P 66-9/7 with 112.3 cm and the highest was Prilep Basma 82 with 148.1 cm

- The height of the stalk without inflores-

cence has a similar pattern of differences among the investigated tobacco varieties.

- Climate conditions in 2010 were better for growth of tobacco plant, because the average height in all investigated varieties was increased by 8.4 cm compared to 2009.
- Differences in stalk height with and without inflorescence in all tobacco varieties is a result of the genotype, i.e. it is a varietal trait.

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