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THE SIZE AND NUMBER OF MIDDLE BELT LEAVES IN SOME VARIETIES OF WILD TOBACCO

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Abstract

In contrast to the cultivated type *Nicotiana tabacum*, which has haploid number of chromosomes (24), wild tobacco species differ in the number of chromosomes and in morphological properties also, such as: stalk, leaf number, flowers and plant height. Some wild tobaccos species have the same number of chromosomes as the cultivated tobacco and can be easily used for crossbreeding. This should be emphasized because the most important reasons for crossing are plant resistance to diseases and inheritance of some morphological traits, e.g. higher leaf number, shorter vegetation period, etc. The trial was set up in the experimental field of the Scientific Tobacco Institute – Prilep in 2014 and it included the following species: *N. rustica, N. alata, N. longiflora, N. petunia hybrida, N. repanda, N. glutinosa, N. miarsii, N. undulate*. The obtained results were compared with the standard variety P 12-2/1.

The aim of the study was to analyze some morphological traits (length, width and number of middle belt leaves) of tobaccos grown in the region of Prilep and to compare them with the cultivated species *N. tabacum*. The results of the study will be of benefit to tobacco breeders. Data on morphological measurements were statistically processed using the following parameters: mean error of the average ($c\bar{x}$), standard deviation (σ) and coefficient of variation CV%.

Key words: *length, width, number of middle belt leaves*

INTRODUCTION

Tobacco plant is classified in the genus Nicotiana, tribe Cestineae, family Solanaceae, order Symetale, class Magnoliopsida (dicotyledons).

There are two classifications of the genus Nicotiana: after Doncho Kostov and after Goodspeed. The classification of the Bulgarian scientist Doncho Kostov is based on morphological characteristics, but also on cytogenetic differences (Uzunoski, 1985). According to Kostov, all Nicotiana species are divided into two groups:

1. American tobacco
2. Australian tobacco

The classification of Goodspeed is based, in addition to morphological differences, on geographical origin, cytological characteristics and number of chromosomes. The author classifies the genus Nicotiana into three subgenera, subdivided into sections and species. Wild species are a real treasure. By their crossbreeding, a great number of forms with different morphological and biological characters can be created and used in selection. N. glauca species can survive at a temperature of - 10^0C, which can be used to create varieties that can resist low temperatures. *N. silvestris* does not contain nicotine and can be used to create varieties with less nicotine content (Uzunoski, 1985). Some species are resistant to drought and some species of the Attenuata section are used to create varieties with shorter vegetative cycle.

MATERIAL AND METHODS

The trial was set up in the field of the Scientific Tobacco Institute – Prilep, in randomized block design with 3 replications. Eight wild species were included in the trial: *N. rustica* - Fig. 1, *N. alata* - Fig. 2, *N. longiflora* - Fig. 3, *N. petunia hybrida* - Fig. 4, *N. repanda* - Fig. 5, *N. glutinosa* - Fig. 6, *N. miersii* - Fig. 7, *N. undulata* - Fig. 8 and the cultivated tobacco variety P-12-2/1 was used as a standard. Seedlings were grown in the seedbeds of Tobacco Institute – Prilep and the same cultural practices and protective measures were applied for all wild species included in the study, both in seedbeds and in field. Morphological measurements were made in the stage of full bloom, on five stalks of each species. Data from the morphological measurements were processed by variational statistical method, using the following parameters: mean error ($c\bar{x}$), standard deviation (σ) and coefficient of variation (CV%), estimated according to Najcheska (2002), Filiposki (2011) and Korubin-Aleksoska (2017).

Figure 1. *N. rustica*

Figure 2. *N. alata*

Figure 3. *N. longiflora*

Figure 4. *N. petunia hybrida*

Figure 5. *N. repanda*

Figure 6. *N. glutinosa*

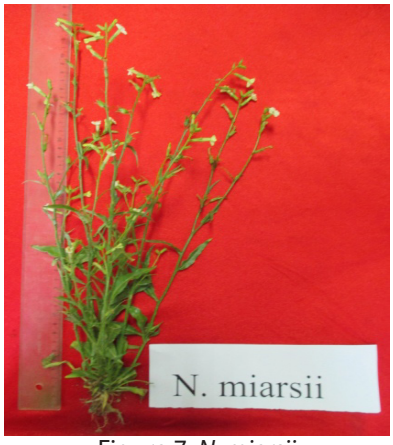

Figure 7. *N. miersii*

Figure 8. *N. undulata*

RESULTS AND DISCUSSION

Morphological properties are among the most important characteristics for recognizing different types and varieties of tobacco and other plant species. Under the influence of external factors, plants are subject to certain changes. Thus, in conditions of abundant precipitation, the plant habitus increase and in drought the habitus decreases, but still, the typical form of the plant is retained. Rudolf (1973) reported that under the influence of external environment, some characters undergo only insignificant changes and others are subject to large variations, such as the quantitative characters plant height, number of leaves and thickness, as well as some qualitative characters (chemical composition). Our investigations were focused on the dimensions of the middle belt leaves and the number of leaves of some wild species in the region of Prilep.

Length of the middle belt leaves

The average length of the middle belt leaves is presented in Table 1. Leaf length was measured in the stage of full bloom. The highest average length of the middle belt leaf was recorded in the check variety P-12-2 / 1 (26.6 cm ± 0.64) and it has the lowest standard deviation (0.64), with insignificant coefficient of variation (5.71%), which shows that this variety is stable. The smallest length of the middle belt leaves was recorded in *N. miersii* (2.3 cm ± 0.12), with coefficient of variation 11.90%, which indicates medium variability of this character. Najcheska (2002) reported that variability of a character is insignificant if the coefficient of variation (CV) is not exceeding 10%, medium if CV is between 10 and 20% and significant if CV is higher than 20%. For the length of middle belt leaves, the highest standard deviation of 2.17 and coefficient of variation of 17.77% was calculated in *N. repanda*. The lowest standard deviation was calculated in *N. miersii* (0.27) and the lowest coefficient of variation in *N. rustica* (3.29%).

Table 1. Average length of the middle belt leaves.

Variety/Species	Length (cm)		
	$\bar{x} \pm c\bar{x}$	σ	CV%
N. tabacum P-12-2/1	26.6 ± 0.64	0.64	5.71
N. rustica	14.4 ± 0.21	0.47	3.29
N. alata	19.2 ± 0.58	1.30	6.79
N. longiflora	19.2 ± 0.58	1.30	6.79
N. petunia hybrida	13.5 ± 0.35	0.79	5.85
N. repanda	12.2 ± 0.97	2.17	17.77
N. glutinosa	8.9 ± 0.37	0.82	9.23
N. miersii	2.3 ± 0.12	0.27	11.90
N. undulata	19.2 ± 0.58	1.30	6.79

Width of the middle belt leaves

The average width of the middle belt leaves (Table 2) is the highest in *N. rustica* (11.3 cm ± 0.46), with standard deviation being 1.04 and coefficient of variation 9.18%. *N. myersii* is characterized by the smallest width of the leaves (2.3 cm ± 0.12), with the lowest standard deviation (0.22) and the highest coefficient of variation (20.33%). According to the data obtained, the standard deviation is low, which is an indication of stability of the investigated wild species, including the check variety. According to Najcheska (2002) and Filiposki (2011), the coefficient of variation has significance if it has a positive value. For leaf width, the tested wild species are characterized by medium variability, except for *N. myersii*, which coefficient of variation of 20.33% indicates that this species has significant variability. According to the obtained data, it can be stated that the tested wild species are characterized by small size of the leaves, both in length and in width.

Table 2. Average width of the middle belt leaves.

Variety/Species	Width (cm)		
	$\bar{x} \pm c\bar{x}$	σ	CV%
N. tabacum P-12-2/1	10.5 ± 0.57	0.65	12.27
N. rustica	11.3 ± 0.46	1.04	9.18
N. alata	8.5 ± 0.63	1.41	16.64
N. longiflora	8.5 ± 0.63	1.41	16.63
N. petunia hybrida	8.6 ± 0.19	0.42	4.86
N. repanda	10.0 ± 0.67	1.50	15.00
N. glutinosa	7.6 ± 0.19	0.42	5.50
N. miersii	1.1± 0.10	0.22	20.33
N. undulata	8.5 ± 0.63	1.41	16.64

Number of leaves

The average leaf number is presented in Table 3. The largest number of leaves (44) was counted in *N. petunia hybrida*, with standard deviation of 2.86 and coefficient of variation 6.48%. The lowest number of leaves (8-9) was recorded in *N. undulate*, with standard deviation of 2.95 and coefficient of variation 8.88%. Kochoska (2006) reported that in the same semi-oriental varieties and lines tested, the number varied 1 - 3 leaves compared to the check, depending on the conditions of breeding (non-irrigated check and irrigated trial).

Table 3. The average number of leaves.

Variety/Species	Leaf number		
	$\bar{x} \pm c\bar{x}$	σ	CV%
N. tabacum P-12-2/1	38.0 ± 1.61	1.27	9.49
N. rustica	10.0 ± 4.06	9.08	18.92
N. alata	33.2 ± 1.32	2.95	8.88
N. longiflora	33.2 ± 3.97	2.95	8.88
N. petunia hybrida	44.2 ± 1.28	2.86	6.48
N. repanda	23.6 ± 0.87	1.95	8.26
N. glutinosa	32.2 ± 1.85	4.15	12.88
N. miersii	19.8 ± 1.39	3.11	15.73
N. undulata	8.5 ± 3.97	2.95	8.88

CONCLUDING REMARKS

The largest length of the middle belt leaf was measured in the check variety P-12-2 / 1 (26.6 ± 0.64), with coefficient of variation 5.71%, and the smallest length in wild species *N. myersii* (2.3 ± 0.12), with coefficient of variation 11.90%.

For the character length of the middle belt leaves in the wild species tested, the highest standard deviation of 2.17 and coefficient of variation 17.77% was found in *N.repanda*. The lowest standard deviation was recorded in *N. miersii* (0.22), and the lowest coefficient of variation in *N. rustica* (3.29%). From the obtained data it can be stated that the variability of the character length of the middle belt leaf is medium.

The largest average width was measured in the leaves of *N. rustica* (11.3±0.46), with standard deviation 1.04 and coefficient of variation 9.18%. The wild species *N. miersii* has the smallest width of the leaves (2.3±0.12), with lowest standard deviation (0.22) and the highest coefficient of variation (20.33%).

The largest number of leaves (44) was counted in the wild species *N. petunia hybrid*, which is characterized by standard deviation of 2.86 and coefficient of variation 6.48%. The lowest number of leaves was counted in the wild species *N. undulata* (8-9), which had standard deviation 2.95 and coefficient of variation 8.88%.

According to the obtained data, it can be stated that wild species grown in the region of Prilep are characterized by insignificant to medium variability of the investigated characters.

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ДИМЕНЗИИ И БРОЈ НА ЛИСТОВИ ОД СРЕДНИОТ ПОЈАС КАЈ НЕКОИ ДИВИ ВИДОВИ ТУТУН

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Резиме

За разлика од културниот вид тутун *N. mabacum* кој се одликува со хаплоиден број на хромозоми (24), дивите видови тутун се одликуваат со различен број на хромозоми и со многу различни морфолошки својства на растението, и тоа во стеблото, бројот на листови, цветовите и висината на растенијата. Одреден број диви видови имаат ист број на хромозоми со културниот вид тутун и лесно може да се искористат за вкрстување. Ова го нагласуваме бидејќи една од поважните причини за вкрстување во селекцијата е и својството отпорност на растенијата од болести, како и наследувањето на некои морфолошки особини, на пример поголем број на листови, добивање на растенија со краток вегетациски период и др. Опитот беше поставен во опитното поле на Научниот институт за тутун – Прилеп во 2014 година, при што беа испитувани дивите видови: *N. pustica*, *N. alata*, *N. longiflora*, *N petunija hibrida*, N. *repanda*, *N. glutinosa*, *N. miarsii*, *N. undulate*, чии вредности беа споредувани со контролната сорта тутун П 12-2/1. Целта на испитувањето беше да се анализираат морфолошките својства на тутуните одгледувани во Прилепскиот регион (должина, ширина и број на листови од средниот појас) и да се споредат со културниот вид *N. tabacum*, а добиените податоци да бидат придонес за селекцијата. Податоците од морфолошките мерења беа варијационо-статистички обработени со следниве статистички параметри: средна грешка на средната вредност (сx̄), стандардна девијација (σ) и варијационен коефициент CV%.

Клучни зборови: *должина, ширина, број на лисја, среден појас.*