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Components of Genetic Variance of Leaf Parameters in Burley Tobacco

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SUMMARY

Four parent burley tobacco cultivars and their 6 F_1 hybrids were included in the 4-year trial (1992 to 1995). The trial was set up according to the RCBD in 4 replications. According to the components of genetic variance, the manner of inheritance of seven leaf parameters, depending on the leaf position on stalk, was estimated.

The leaf length, leaf width, leaf area and leaf thickness were equally inherited by additive and nonadditive variance, while the leaf angle was only inherited by additive variance, independently of leaf position on stalk. The inheritance of L/W leaf ratio and leaf weight changed depending on their stalk position.

According to the estimated degree of dominance for all studied traits the overdominant inheritance was present on 12th and 18th leaf position, while in some years the partial dominance was present on 6th leaf position. According to the F and Kd/Kr ratio values prepondence of dominant genes over recessive genes was estimated, independently of leaf position on stalk. No symmetric distribution of dominant and recessive genes in parents was obtained.

KEY WORDS

Nicotiana tabacum L, **burley, components of genetic variance, leaf parameters, leaf position on stalk.**

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Komponente genetske varijance parametara lista duhana tipa burley

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SAŽETAK

U četverogodišnji pokus (1992-1995) uključena su bila četiri kultivara duhana tipa burley, te šest njihovih F_1 hibrida. Pokus je proveden prema metodi SBR u četiri ponavljanja. Pomoću komponenata genetske varijance utvrđen je način nasljeđivanja sedam svojstava lista u ovisnosti o njihovu položaju na stabljici.

Utvrđeno je da se dužina, širina, površina i debljina lista nasljeđuju podjednako pod utjecajem aditivne i neaditivne varijance, dok se kut otklona lista nasljeđuje samo pod utjecajem aditivne varijance, neovisno o položaju lista na stabljici. Nasljeđivanje odnosa dužine i širine lista, te težine lista mijenja se u ovisnosti o njihovom položaju na stabljici.

Na osnovi procjenjenog stupnja dominantnosti za sva istraživana svojstva prisutan je superdominantan način nasljeđivanja za 12. i 18. list, dok je u pojedinim godinama za 6. list prisutna parcijalna dominacija. Prema dobivenim vrijednostima za F i Kd/Kr odnos prevladavaju dominantni geni u odnosu na recesivne, neovisno o položaju lista na stabljici. Nije dobivena simetrična raspodjela dominantnih i recesivnih gena u roditelja.

KLJUČNE RIJEČI

Nicotiana tabacum L, **burley, komponente genetske varijance, parametri lista, položaj lista na stabljici**

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INTRODUCTION

The inheritance of some traits, among other things, determines by the components of genetic variance. Additive-dominant model after Hayman (1954), Jinks (1954) and Mather and Jinks (1971), according to the opinion of the numerous authors, is one of the most suitable model for estimating inheritance and the manner of inheritance. According to this model numerous investigations of the manner of inheritance with all well-known tobacco types, but also with inter types crosses were studied. Previous investigations point equally significant additive, but also nonadditive variance in inheritance of leaf parameters (leaf length, leaf width, leaf area, leaf weight etc.). Different results were obtained depending on the investigated traits, but also on the genetic materials, as well as the leaf position on the stalk. Only significant additive variance was estimated in inheritance of leaf thickness (Jadeja et al., 1984) and also in inheritance of leaf area (Sastry and Prasada Rao,1980). On the other hand, Povilaitis (1967) obtained the different models of inheritance of leaf length and width depending on leaf position on the stalk. Thus, he obtained significant additive and dominant variance for middle leaves and dominance indicating asymmetry of positive and negative effects of genes. According to the same author (1966) leaf weight was also inherited additively and nonadditively. However, according to some other investigations only nonadditive variance was significant. Thus, Chang and Shyu (1980) estimated only significant nonadditive variance in inheritance of leaf length, Noveva et al. (1985) in inheritance of leaf width, Oinuma (1979) and Noveva and Lidanski (1985) in inheritance of L/W leaf ratio and Dražić (1986) in inheritance of leaf area.

The goal of these investigations was to estimate, on specific genetic materials the manner of inheritance of seven chosen leaf parameters including also the manner of inheritance of these parameters in consideration of their position on the stalk.

MATERIALS AND METHODS

Four-year investigations (1992-1995), in which 10 burley tobacco genotypes were included, were carried out at the experimental field of the Tobacco Institute Zagreb in Božjakovina. Along with four line tobacco cultivars, viz. American line cultivar TN 86 (Miller, 1987) and three burley lines of the Tobacco Institute Zagreb - BL 1, Hy 71 (Devčić and Bolsunov, 1975) and Poseydon (Devčić et al. 1984), the trial was included also their six F_1 hybrids obtained a year earlier: Hy 71×TN 86, Hy 71×BL1, Hy 71×Poseydon, Poseydon×BL1, Poseydon×TN 86 i TN 86×BL1.

The trial was set up according to the RCBD in four replications. Standard agrotechnics for this tobacco type were applied in tobacco growing.

The following leaf parameters were studied: leaf length, leaf width, L/W leaf ratio, leaf area, leaf thickness, leaf weight and leaf angle. Leaf length was measured from the leaf top to the leaf base and leaf width on the widest part of leaf lamina in cm. L/W leaf ratio is expressed by their quotient and leaf area in cm^2 is obtained multiplying length by width and the previously determined coefficient for the mentioned genotypes (Butorac, 1994). Leaf angle was determined by measuring the angle between stalk and the middle vein in the leaf base. After drying by standard procedure, leaf weigth in grammes and leaf thickness in 10^{-3} mm by micrometer were determined on the same leaves. All leaf parameters were measured on 6^{th}, 12^{th} and 18^{th} leaf. Data were taken on a sample of 80 plants for each genotype and for each leaf position on the stalk.

Data for all the traits studied and for each investigation year were processed statistically by the analysis of variance and L.S.D. test was performed. Genetic variability was analyzed on the tested material in all investigation years and components of genetic variance (D, H_1, H_2, F, E, $\sqrt{H_1/D}$, $H_2/4H_1$ and Kd/Kr) were estimated using the methods of Jinks (1954), Hayman (1954) and Mather and Jinks (1971).

RESULTS

Significant differences between parents and F_1 hybrids were found in all traits measured and all years, except for L/W ratio of 6^{th} leaf in 1993 and 1995 and angle of 6^{th} and 18^{th} leaves in 1992 and 1995, as well as angle of 6^{th}, 12^{th} and 18^{th} leaves in 1994 (Tables 1-3).

Components of genetic variance were estimated in order to study the manner of inheritance of the seven chosen traits (leaf length, leaf width, L/W leaf ratio, leaf area, leaf thickness, leaf weight and leaf angle). Their values, standard errors and significance, depending on their position on the stalk, are given in Tables 4-6. The statistics representing additive and dominance effects of genes were significant for leaf length, leaf width, leaf area and leaf thickness on all leaf positions on stalk and for L/W ratio of 6^{th} and 12^{th} leaves and for weight of 12^{th} leaf. Thus, it may be taken that additive and non-additive variance participated to nearly the same extent in inheritance of these traits. Obtained results on weight of 6^{th} and 18^{th} leaves and L/W ratio of 18^{th} leaf point primarily to a greater role of the additive component of variance, but also an equal role of additive and nonadditive variance in some years. However, leaf angle is inherited additively, independently of leaf position on the stalk and the investigation year. Values F for all investigated traits, mostly for 12^{th} and 18^{th} leaf in one or two investigation years, were higher than values D. It means that for these traits interallel interaction was present. F is mainly of a positive sign and mostly marks dominant action for the most studied traits and years, independently of leaf position on the stalk, but only the F values, mostly for the 12^{th} and 18^{th} leaf, in one or two investigation years were significant. Values F are of a negative sign for leaf area, leaf thickness and leaf angle in two investigation years on all leaf positions on the

Table 1. Analysis of variance for leaf parameters on 6th position

Year	Source of variation	d.f.	F values						
			Leaf length	Leaf width	L/W ratio	Leaf area	Leaf thickness	Leaf weight	Leaf angle
1992	Crosses	9	9,93*	9,32*	7,16*	8,88*	14,67*	6,88*	1,10N.S.
	Error	27							
	Total	39							
1993	Crosses	9	4,59*	4,56*	1,58N.S.	5,39*	17,93*	3,27*	4,06*
	Error	27							
	Total	39							
1994	Crosses	9	13,75*	16,85*	4,23*	14,76*	4,62*	10,83*	1,85N.S.
	Error	27							
	Total	39							
1995	Crosses	9	4,64*	4,79*	2,08N.S.	5,92*	2,60*	5,43*	0,33N.S.
	Error	27							
	Total	39							

Table 2. Analysis of variance for leaf parameters on 12th position

Year	Source of variation	d.f.	F values						
			Leaf length	Leaf width	L/W ratio	Leaf area	Leaf thickness	Leaf weight	Leaf angle
1992	Crosses	9	7,99*	5,92*	8,66*	6,06*	24,62*	6,09*	27,30*
	Error	27							
	Total	39							
1993	Crosses	9	5,97*	4,59*	3,89*	5,96*	10,18*	9,66*	12,37*
	Error	27							
	Total	39							
1994	Crosses	9	15,70*	7,89*	10,89*	9,77*	5,41*	4,17*	2,24N.S.
	Error	27							
	Total	39							
1995	Crosses	9	14,69*	8,88*	11,26*	9,63*	4,89*	13,32*	3,37*
	Error	27							
	Total	39							

Table 3. Analysis of variance for leaf parameters on 18th position

Year	Source of variation	d.f.	F values						
			Leaf length	Leaf width	L/W ratio	Leaf area	Leaf thickness	Leaf weight	Leaf angle
1992	Crosses	9	4,89*	4,11*	20,40*	3,70*	18,58*	3,53*	0,69N.S.
	Error	27							
	Total	39							
1993	Crosses	9	3,38*	3,28*	3,73*	3,58*	7,80*	3,48*	2,98*
	Error	27							
	Total	39							
1994	Crosses	9	11,28*	9,90*	15,00*	8,22*	15,81*	8,91*	1,73N.S.
	Error	27							
	Total	39							
1995	Crosses	9	18,87*	13,90*	3,97*	13,76*	8,87*	21,21*	0,92N.S.
	Error	27							
	Total	39							

stalk. Therefore, recessive alleles are predominant in these investigation years. Kd/Kr ratios are in line with the interpretation of values obtained for F values. Due to negative values D, H_1 and H_2 obtained for weight of 6th leaf, angle of 6th and 18th leaves in 1992, thickness of 18th leaf in 1993 and angle of 18th leaf in 1995, it was not possible to calculate the values for $\sqrt{H1/D}$ and Kd/Kr. According to the degree of dominance ($\sqrt{H1/D}$), overdominance in inheritance was estimated for all traits and most of the investigation years, except for all traits of 6th leaf in one to three years. The mentioned traits of 6th leaf were inherited partly dominantly in these years. However, length of 18th leaf in 1992 and weight of 12th leaf in 1994 were inherited complete dominantly, be-

Table 4. Components of genetic variance, standard errors and significance for leaf parameters on 6^{th} position

Year	Components of genetic variance	Trait						
		Leaf length	Leaf width	L/W ratio	Leaf area	Leaf thickness	Leaf weight	Leaf angle
1992	D	34,26++-6,96*	11,85+/-1,04*	6,57+/-9,18*	49580,14+/-5361,04*	2,64+/-0,18*	1,19+/-9,18*	0,35+/-0,47N.S.
	H1	41,49+/-20,25*	3,59+/-3,03N.S.	5,25+/-2,67*	35312,93+/-15583,96*	2,20+/-0,54*	-4,11+/-0,26N.S.	-30,86+/-1,38N.S.
	H2	43,85+/-18,69*	5,24+/-2,80N.S.	3,92+/-2,46N.S.	41378,10+/-14385,20*	1,98+/-0,50*	0,23+/-0,24N.S.	-23,83+/-1,28N.S.
	F	5,77+/-17,90N.S.	-2,74+/-2,68N.S.	3,66+/-2,36N.S.	-14325,93+/-13772,78N.S.	1,48+/-0,48*	-0,86+/-0,23N.S.	-10,60+/-1,22N.S.
	E	14,79+/-3,11*	4,41+/-0,46*	5,51+/-4,10N.S.	18648,20+/-2397,53*	0,11+/-8,14N.S.	0,60+/-4,10*	14,83+/-0,21*
	H2/4H1	0,26	0,37	0,18	0,29	0,22	-	-
	H1/D	1,10	0,55	0,89	0,84	0,91	-	-
	Kd/Kr	1,16	0,65	1,90	0,70	1,88	-	-
1993	D	5,18+/-5,10N.S.	3,15+/-1,88N.S.	2,32+/-2,14N.S.	14034,60+/-8471,98N.S.	1,13+/-2,56*	1,13+/-1,07N.S.	17,22+/-8,00*
	H1	57,48+/-14,82*	19,49+/-5,47*	1,96+/-6,22*	94800,75+/-24627,10*	1,36+/-7,44*	5,95+/-3,11N.S.	40,99+/-23,27N.S.
	H2	54,12+/-13,68*	18,81+/-5,05*	1,73+/-5,74*	90895,87+/-22732,72*	1,37+/-6,87*	5,29+/-2,87N.S.	30,10+/-21,48N.S.
	F	-0,50+/-13,10N.S.	0,64+/-4,83N.S.	4,86+/-5,50N.S.	-4135,23+/-21764,93N.S.	-7,81+/-6,57N.S.	0,26+/-2,75N.S.	20,49+/-20,57N.S.
	E	4,04+/-2,28N.S.	1,52+/-0,84N.S.	4,09+/-9,58*	6391,90+/-3788,78N.S.	5,20+/-1,14*	0,73+/-0,47N.S.	3,48+/-3,58N.S.
	H2/4H1	0,23	0,24	0,22	0,23	0,25	0,22	0,18
	H1/D	3,32	2,48	2,90	2,59	1,09	2,28	1,54
	Kd/Kr	0,97	1,08	2,12	0,89	0,93	1,10	2,26
1994	D	43,61+/-7,65*	14,21+/-2,60*	2,26+/-2,90*	42395,10+/-10320,99*	0,12+/-0,04*	1,59+/-0,25*	9,96+/-1,35*
	H1	52,85+/-22,26*	16,38+/-7,58*	1,68+/-8,44*	62754,25+/-30001,96*	1,15+/-0,13*	2,24+/-0,73*	4,63+/-3,94N.S.
	H2	48,65+/-20,54*	15,03+/-6,99*	1,50+/-7,79N.S.	58613,87+/-27694,11*	0,98+/-0,12*	2,05+/-0,68*	5,37+/-3,64N.S.
	F	19,55+/-19,67N.S.	3,04+/-6,70N.S.	-7,82+/-7,46N.S.	30918,01+/-26515,10N.S.	-0,22+/-0,11N.S.	0,69+/-0,65N.S.	4,23+/-3,49N.S.
	E	3,57+/-3,42N.S.	1,22+/-1,16N.S.	5,56+/-1,29*	4673,06+/-4615,68N.S.	8,54+/-2,04*	0,20+/-0,11N.S.	20,75+/-0,60*
	H2/4H1	0,23	0,22	0,22	0,23	0,21	0,22	0,28
	H1/D	1,10	1,07	0,86	1,21	3,06	1,18	0,68
	Kd/Kr	1,51	1,22	0,66	1,06	0,94	1,45	1,90
1995	D	30,17+/-3,64*	12,69+/-0,70*	2,99+/-6,11*	35889,88+/-3879,33*	7,18+/-0,14N.S.	3,20+/-0,24*	-4,63+/-0,61N.S.
	H1	29,13+/-10,58*	10,80+/-2,06*	2,46+/-1,77N.S.	34390,09+/-11276,78*	1,28+/-0,42*	2,68+/-0,72*	-10,07+/-1,78N.S.
	H2	24,96+/-9,76*	9,31+/-1,90*	1,70+/-1,64N.S.	30577,54+/-10409,34*	0,97+/-0,39*	2,25+/-0,66*	-8,50+/-1,65N.S.
	F	7,67+/-9,35N.S.	4,15+/-1,82*	2,70+/-1,57N.S.	3342,58+/-9966,17N.S.	0,34+/-0,37N.S.	1,02+/-0,63N.S.	-6,71+/-1,58N.S.
	E	4,93+/-1,62*	1,71+/-0,31*	8,69+/-2,73*	4670,33+/-1734,88*	0,11+/-6,55N.S.	0,38+/-0,11*	6,25+/-0,27*
	H2/4H1	0,21	0,21	0,17	0,22	0,19	0,20	-
	H1/D	0,98	0,92	0,90	0,97	4,22	0,91	1,47
	Kd/Kr	1,30	1,43	2,98	1,09	3,59	1,42	0,34

Table 5. Components of genetic variance, standard errors and significance for leaf parameters on 12th position

Year	Components of genetic variance	Trait						
		Leaf length	**Leaf width**	**L/W ratio**	**Leaf area**	**Leaf thickness**	**Leaf weight**	**Leaf angle**
1992	D	35,26+/-10,93*	5,63+/-2,18*	9,93+/-9,31*	21002,20+/-8152,74*	2,05+/-2,94*	0,88+/-7,88*	34,18+/-7,28*
	H1	73,28+/-31,78*	10,54+/-6,35N.S.	1,54+/-2,70*	54035,66+/-23699,20*	2,38+/-8,54*	0,97+/-0,22*	36,89+/-21,16N.S.
	H2	75,94+/-29,34*	11,15+/-5,86N.S.	1,22+/-2,49*	56447,24+/-21876,18*	2,21+/-7,89*	1,14+/-0,21*	28,84+/-19,53N.S.
	F	-10,27+/-28,09N.S.	-2,03+/-5,61N.S.	1,13+/-2,39*	-12527,72+/-20944,85N.S.	0,99+/-7,55*	-0,42+/-0,20N.S.	0,59+/-18,70N.S.
	E	15,05+/-4,89*	2,92+/-0,97*	6,44+/-4,16N.S.	12645,97+/-3646,03*	0,05+/-0,01*	0,37+/-0,03*	0,94+/-3,25N.S.
	H2/4H1	0,26	0,26	0,19	0,26	0,23	0,29	0,19
	H1/D	1,44	1,36	1,24	1,60	1,07	1,05	1,03
	Kd/Kr	0,82	0,76	2,68	0,68	1,57	0,63	1,01
1993	D	17,82+/-6,03*	3,87+/-0,82*	4,66+/-1,43*	15226,77+/-4551,12*	0,47+/-7,55*	2,11+/-1,33N.S.	23,44+/-3,31*
	H1	53,66+/-17,53*	8,25+/-2,40*	8,77+/-4,16*	49045,84+/-13229,62*	2,20+/-0,21*	10,43+/-3,87*	15,80+/-9,63N.S.
	H2	50,58+/-16,18*	8,22+/-2,22*	7,86+/-3,84*	48549,79+/-12211,95*	2,19+/-0,20*	9,73+/-3,57*	12,00+/-8,89N.S.
	F	7,42+/-15,49N.S.	0,87+/-2,12N.S.	4,57+/-3,67N.S.	-2436,90+/-11692,05N.S.	0,13+/-0,19N.S.	0,81+/-3,42N.S.	0,79+/-8,51N.S.
	E	4,19+/-2,69	1,22+/-0,37*	8,94+/-6,40N.S.	4795,90+/-2035,32*	7,08+/-3,37*	0,43+/-0,59N.S.	1,19+/-1,48N.S.
	H2/4H1	0,24	0,25	0,22	0,25	0,25	0,23	0,19
	H1/D	1,73	1,45	1,37	1,79	2,16	2,21	0,80
	Kd/Kr	1,27	1,17	2,11	0,91	1,14	1,18	1,04
1994	D	75,21+/-15,63*	11,54+/-2,55*	1,30+/-1,66*	40244,18+/-11280,78*	0,15+/-4,04*	0,47+/-0,15*	7,80+/-0,94*
	H1	110,75+/-45,43*	15,57+/-7,42*	1,21+/-4,79*	65243,96+/-32791,97*	0,97+/-0,11*	0,49+/-0,45N.S.	3,08+/-2,73N.S.
	H2	96,31+/-41,94*	13,61+/-6,85*	1,12+/-4,42*	57559,69+/-30269,50N.S.	1,00+/-0,10*	0,51+/-0,41N.S.	4,22+/-2,52N.S.
	F	59,21+/-40,15N.S.	6,52+/-6,56N.S.	5,41+/-4,24N.S.	23351,93+/-28980,85N.S.	-3,12+/-0,10N.S.	-0,19+/-0,39N.S.	-5,52+/-2,41N.S.
	E	4,64+/-6,992N.S.	1,49+/-1,14N.S.	6,78+/-7,38N.S.	5200,95+/-5044,91N.S.	7,29+/-1,80*	0,21+/-6,94*	3,52+/-0,42*
	H2/4H1	0,22	0,22	0,23	0,22	0,25	0,26	0,34
	H1/D	1,21	1,16	0,96	1,27	2,49	1,00	0,62
	Kd/Kr	1,96	1,64	1,54	1,59	0,92	0,67	0,27
1995	D	45,60+/-11,54*	13,44+/-1,43*	1,94+/-5,68*	40145,62+/-8607,86*	0,27+/-4,98*	4,83+/-0,58*	9,51+/-4,84*
	H1	182,16+/-33,54*	32,50+/-4,16*	7,44+/-1,65*	172551,10+/-25022,10*	1,02+/-0,14*	13,75+/-1,71*	28,05+/-14,08*
	H2	164,95+/-30,96*	28,96+/-3,84*	6,35+/-1,52*	159168,30+/-23097,33*	1,06+/-0,13*	12,21+/-1,58*	23,31+/-13,00N.S.
	F	55,54+/-29,64N.S.	14,23+/-3,67*	9,11+/-1,46*	45575,78+/-22114,00*	-0,22+/-0,12N.S.	5,47+/-1,51*	-0,66+/-12,45N.S.
	E	3,33+/-5,16N.S.	1,23+/-0,64N.S.	8,06+/-2,54*	5069,46+/-3849,55N.S.	0,11+/-2,23*	0,30+/-0,26N.S.	0,20+/-2,16N.S.
	H2/4H1	0,23	0,22	0,21	0,23	0,26	0,22	0,20
	H1/D	1,99	1,55	0,61	2,07	1,92	1,68	1,71
	Kd/Kr	1,87	2,03	2,22	1,75	0,65	2,01	0,96

Table 6. Components of genetic variance, standard errors and significance for leaf parameters on 18th position

Year	Components of genetic variance	Trait						
		Leaf length	Leaf width	L/W ratio	Leaf area	Leaf thickness	Leaf weight	Leaf angle
1992	D	23,70+/-3,51*	1,70+/-0,22*	1,85+/-3,70*	8387,22+/-569,07*	1,58+/-0,13*	0,70+/-8,23*	-9,98+/-4,12N.S.
	H1	23,73+/-10,20*	4,68+/-0,65*	1,92+/-1,07N.S.	9367,10+/-1654,23*	2,87+/-0,40*	0,36+/-0,23N.S.	7,50+/-11,99N.S.
	H2	26,72+/-9,42*	5,18+/-0,60*	1,50+/-9,92N.S.	11145,54+/-1526,98*	2,48+/-0,37*	0,41+/-0,22N.S.	10,62+/-11,06N.S.
	F	-7,91+/-9,02N.S.	-1,39+/-0,57N.S.	3,18+/-9,50N.S.	-3959,04+/-1461,98N.S.	1,24+/-0,35*	0,20+/-0,21N.S.	-10,81+/-10,59N.S.
	E	7,43+/-1,57*	1,02+/-0,10*	1,01+/-1,65N.S.	3700,16+/-254,49*	6,04+/-6,23N.S.	0,18+/-3,68*	10,41+/-1,84*
	H2/4H1	0,28	0,27	0,19	0,29	0,21	0,28	0,35
	H1/D	1,00	1,65	1,01	1,05	1,34	0,72	-
	Kd/Kr	0,71	0,60	1,18	0,63	1,82	1,49	-
1993	D	19,70+/-1,70*	1,64+/-7,46*	6,29+/-7,15*	9471,98+/-1309,82*	-0,01+/-5,91N.S.	0,74+/-7,31*	6,80+/-2,86*
	H1	13,12+/-4,94*	3,67+/-0,21*	4,86+/-2,08*	11544,81+/-3807,51*	2,25+/-0,17*	0,65+/-0,21*	15,47+/-8,33N.S.
	H2	12,58+/-4,56*	4,05+/-0,20*	3,08+/-1,92N.S.	12030,21+/-3514,62*	2,10+/-0,15*	0,54+/-0,19*	11,04+/-7,68N.S.
	F	8,03+/-4,36N.S.	-1,06+/-0,19N.S.	5,70+/-1,83*	534,48+/-3365,00N.S.	0,01+/-0,15N.S.	0,17+/-0,18N.S.	8,05+/-7,36N.S.
	E	3,71+/-0,76*	0,87+/-3,33*	1,17+/-3,20*	2604,80+/-585,77*	0,07+/-0,02*	0,16+/-3,27*	1,70+/-1,28N.S.
	H2/4H1	0,23	0,27	0,15	0,26	0,23	0,20	0,18
	H1/D	0,81	1,49	0,87	1,10	-	0,94	1,50
	Kd/Kr	1,66	0,64	3,12	1,05	-	1,28	2,29
1994	D	52,72+/-8,73*	7,19+/-0,64*	1,14+/-7,61N.S.	27592,26+/-3798,27*	0,22+/-8,04*	1,01+/-0,10*	7,94+/-6,05N.S.
	H1	89,35+/-25,40*	10,11+/-1,86*	3,95+/-2,21N.S.	40414,10+/-11041,15*	2,83+/-0,23*	1,73+/-0,30*	31,56+/-17,58N.S.
	H2	75,26+/-23,44*	8,67+/-1,71*	3,24+/-2,04N.S.	34757,90+/-10191,84*	2,83+/-0,21*	1,59+/-0,28*	22,37+/-16,23N.S.
	F	51,34+/-22,44*	5,48+/-1,64*	1,00+/-1,95N.S.	22253,38+/-9757,93*	-2,91+/-0,20N.S.	0,68+/-0,27*	18,82+/-15,54N.S.
	E	2,79+/-3,90N.S.	0,43+/-0,28N.S.	7,97+/-3,40N.S.	2186,82+/-1698,63N.S.	7,08+/-3,59*	8,97+/-4,73N.S.	4,34+/-2,70N.S.
	H2/4H1	0,21	0,21	0,20	0,21	0,25	0,23	0,18
	H1/D	1,30	1,18	1,85	1,21	3,58	1,30	1,99
	Kd/Kr	2,19	1,94	1,61	1,99	0,93	1,70	3,92
1995	D	57,68+/-12,54*	12,41+/-2,00*	5,73+/-3,37*	48504,91+/-8470,42*	0,36+/-7,96*	4,79+/-1,91*	0,43+/-6,73*
	H1	162,27+/-36,48*	32,96+/-5,82*	1,31+/-9,80N.S.	148044,40+/-24622,58*	0,55+/-0,23*	20,66+/-5,57*	-1,50+/-0,19N.S.
	H2	148,14+/-33,67*	30,05+/-5,37*	5,84+/-9,05N.S.	138435,40+/-22728,54*	0,47+/-0,21*	17,86+/-5,14*	-1,04+/-0,18N.S.
	F	53,40+/-32,24N.S.	12,08+/-5,14*	3,86+/-8,66*	39819,21+/-21760,91N.S.	-4,47+/-0,20N.S.	5,93+/-4,92N.S.	-1,20+/-0,17N.S.
	E	3,12+/-5,61N.S.	0,89+/-0,89N.S.	9,67+/-1,50*	3952,63+/-3788,08N.S.	7,08+/-3,56*	0,24+/-0,85N.S.	0,99+/-3,01N.S.
	H2/4H1	0,22	0,22	0,11	0,23	0,21	0,21	-
	H1/D	1,67	1,62	0,47	1,74	1,24	2,07	-
	Kd/Kr	1,76	1,85	5,72	1,61	0,90	1,84	-

cause the values for $\sqrt{H_1/D}$ is 1. The proportion $H_2/4H_1$, which provides an estimate of the average frequency (uv) of positive (u) versus negative (v) alleles in the parents, where u+v=1 attains a maximum value of 0.25 when these frequencies are equal (uv=0.50 x 0.50=0.25). The estimated values for all traits deviated from 0.25, except for leaf width, leaf area and leaf thickness in one or two investigation years, independently of their position on the stalk. For leaf length, leaf width, leaf area, leaf thickness, leaf weight and leaf angle in one investigation year, independently of their position on the stalk, however, $H_1<H_2$ and therefore the ratio has no particular meaning.

DISCUSSION

Similarity of parents and progenies greatly depends on knowing the relationship between the additive and nonadditive components of variance and mitigate the selection of the investigation materials for creating hybrids or line cultivars. Some previous investigations of tobacco leaf traits point out to significant only additive variance (Sastry and Prasada Rao, 1980, Jadeja et al., 1984), as well as significant only nonadditive variance in inheritance (Oinuma, 1979; Chang and Shyu, 1980, Noveva and Lidanski, 1985, Noveva et al., 1985, Dražić, 1986). It goes without saying, depending on investigation traits, applied methods and also genetic materials, that contrary results were obtained. My investigations are showing an equall role of additive and nonadditive variance in inheritance of all investigation traits, except for leaf angle. However, values for degree of dominance ($\sqrt{H_1/D}$) and values for F i Kd/Kr ratio point out to prepondence of overdominant inheritance. This was also conformed by the investigations of Dražić (1986). Regarding the manner of inheritance of the leaf position on the stalk some differences were observed, too. Thus, for weight of 6^{th} and 18^{th} leaves and for L/W ratio of 18^{th} leaf additive genetic variance plays the main role in inheritance, that is fully confirmed by the obtained values for degree of dominance. It follows that the manner of inheritance, among the other factors, depends also on leaf position on the stalk. This has been also conformed by the investigations of Povilaitis (1967), who obtained the different models of inheritance, depending on leaf position on the stalk.

For the majority of the investigated traits, primarily for the middle leaves - the most qualitative leaves - an equall role in inheritance is played by additive and nonadditive variance. So, the selected genetic material would be oriented to create line or F_1 hybrids depending on the research aims, of course, besides the extra estimations of the other traits. That is to say, a significant heterosis effect could be expected, what is fully confirmed by the values of degree of dominance. The obtained results show that leaf angle and L/W leaf ratio were mostly genetic controlled traits and since these traits are less important for leaf yield and quality, they should not be an obstacle for selection of genetic material towards development of F_1 hybrids.

CONCLUSIONS

According to the obtained results of components of genetic variance in 4-year investigations of 10 chosen burley tobacco genotypes, leaf length, leaf width, leaf area and leaf thickness were equally inherited by additive and nonadditive variance, while the leaf angle is inherited only by additive variance, independently of leaf position on stalk. The manner of inheritance of L/W leaf ratio and leaf weight has changed in dependence on their stalk position in some of the investigation years.

According to the estimated degree of dominance for all studied traits the overdominant inheritance was present, prepondence of dominant genes over recessive genes was estimated and no symmetric distribution of dominant and recessive genes in parents was obtained.

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