

**THE EFFECT OF THE CLIMATE IN THE REGION OF CERRIK UPON
THE BIOLOGICAL, PRODUCTIONAL, AND CHEMICAL FEATURES
OF THE FLUE-CURED TOBACCO**

F. CANLLARI

Tobacco Institute Cerrik, Albania
Duhanski institut Cerrik, Albanija

SUMMARY

In the period of 1988-1990 in the experimental field of Tobacco Institute in Cerrik a trial was carried out on the effect of climate in the region of Cerrik upon Virginia Tobacco. A special attention was paid to the morphological characteristics, the length of the vegetational period, the yield and the quality of the raw and chemical features of cured leaf.

During the three years of our investigations the average temperatures in the period of vegetation are considered suitable for Virginia tobacco, whereas rainfalls and their distribution could be considered unsuitable. In 1989 the rainfall was 61% and 40% more than, respectively, in 1988 and 1990. In 1990 it was almost as in 1988 but had a more regular distribution.

As the result of this climatic conditions there was high significantly yield in 1989 49% and in 1990 44%, as compared to the year 1988, and significantly better quality in 1989. The length of the growing period was significantly less in 1989, whereas the leaf number is significantly greater by the dry years (1988,1990). In 1989 significantly greater length of middle leaf was also found. Chemical analysis of cured tobacco leaf showed higher content of nicotine and other nitrogenous compound in dry condition of 1990 and lower content of reducing sugar, than in 1989.

Based on investigations carried out the following statements might be drawn:

- In the region of Cerrik during the vegetation period the mean air temperature is adequate for high growth and the development of tobacco Virginia plant, but there is a little rainfall and its very irregular distribution.

- The Virginia tobacco grown under this condition of insufficient precipitation is characterized by a relatively low productional and qualitative possibilities, so a successful cultivation of this tobacco requires the application of irrigations.

INTRODUCTION

Last years in Albania as result of the requests always on growing of industry and world's market towards Virginia tobacco the surface under this tobacco type is increasing. The Virginia growing region in Albania characterized from very suitable sunshine and sum of the active temperatures, as the conditions of insufficient precipitation and its very irregular distribution. It is constituted a delicate question considering that the flue cured tobacco was formed under the tropical and subtropical climate of America. So our climate conditions differ from those of Virginia origin, especially rainfalls and its distribution. The aim of this trial was to study the effect of the climate conditions on the morphological properties, agricultural and chemical properties.

Scientific researches showed that in such conditions the yield of the Virginia tobacco decreased (1,3,4,6,7) and a low quality in consequence of a poor maturation of leaves (2,3,4), its difficult drying (2,5,8), a high content of nicotine and total nitrogen and a low proportion of reducing sugar (5,6,8). The dimensions of the leaves decreased in the conditions of the dry climate (1,3,4,6), whereas the leaf number is greater in this one (3,4,7,9). The distribution of rainfall and especially the moment in which rains is often more important for the growth and the quality of Virginia tobacco than total rainfall during the growing season (2,7,9).

MATERIAL AND METHOD

Nicotiana tabacum L. (cv. Virginia C.75) was grown for three years (1988-1990) at Cerrik, Albania on the experimental field of Tobacco Institute in the same ground each year. The land, where the trial was located is grey-brown one. Through the granule-metric analysis results that the land is included into the middle rummed type (coarse and fine sand 44.7%, slit +clay 55.3%). The agrochemical analysis showed that the soil had middle content in nutrients; organic matter 1.07%, total nitrogen 0.11%, available phosphorus and potassium, respectively 2.5 and 8.9 mg/100 g soil.

In each year, plots were replicated four times, as the result data were combined and analyzed over the replications and the years. Plot sizes were 96, 96 and 80 m², respectively, in 1988, 1989 and 1990, with two guard rows between the replications. Plant spacing was 80 cm between the rows and 40 cm on the rows. The experiment was not irrigated. All other the cultural practices were in accordance with those used by growers for flue cured tobacco production. Harvested cured tobacco leaves were analyzed on agronomic and chemical properties. After curing tobacco from each plot was sorted, weighed and graded. The results obtained were statistically analyzed using the variance analysis.

METEOROLOGICAL DATA

The climate conditions during the Virginia tobacco vegetation have a great influence on the yield and especially on the quality of this tobacco. Some meteorological data of Cerrik are presented in the Table 1.

Table 1. Meteorological data during the vegetation period
 Tablica 1. Meteorološki podaci tijekom vegetacijskog razdoblja

Months	Temperatures °C			Precipitation mm		
	1988	1989	1990	1988	1989	1990
April	13.5	15.2	14.3	27.5	6.5	13.0
May	18.9	16.4	18.6	9.3	96.3	49.2
June	21.3	19.4	21.7	124.5	113.3	5.3
July	26.7	24.4	25.6	1.4	-	-
August	25.9	24.6	25.0	1.6	48.4	54.6
September	21.3	20.7	20.8	-	-	66.5
Sum				164.3	264.5	188.6

The mean air temperature in April, transplanting time of tobacco, is about 13-15 °C, which is good for seedling establishment. The temperature in the May and following months of vegetation are also adequate for high growth rate of Virginia tobacco plant and development of certain characteristics which define the quality of this tobacco type (2,3,7,9).

While that the average temperatures in the period of vegetation are considered suitable, the precipitation and its distribution could be considered unsuitable. The precipitation data showed that there were considerable differences in their amount and distribution. By rainfalls, the year 1988 and 1990 could be considered dry, whereas the year 1989 relatively wet one. In course of 1989 a rainfall of 265 mm was recorded which was 61% and 40% higher, respectively, as compared to ones of 1988 and 1990. It is important too to be emphasized that though in the last two years, their rainfalls had almost the same values, in 1990 it was more effective because its more regular distribution. In 1990, the precipitations were generally on the pleased level for three months of vegetation (May, August and September), whereas others hadn't any rain. In 1988 it was rained mainly in one month (June 76%) and others were almost without rains, except for April, in which rained about 16.7%, but during this month the plant's needs according to the water are low and have chiefly helped the plants to root. Such a distribution of precipitation and their quantities have showed their effect towards plant's growing and development indexes, their production and its quality.

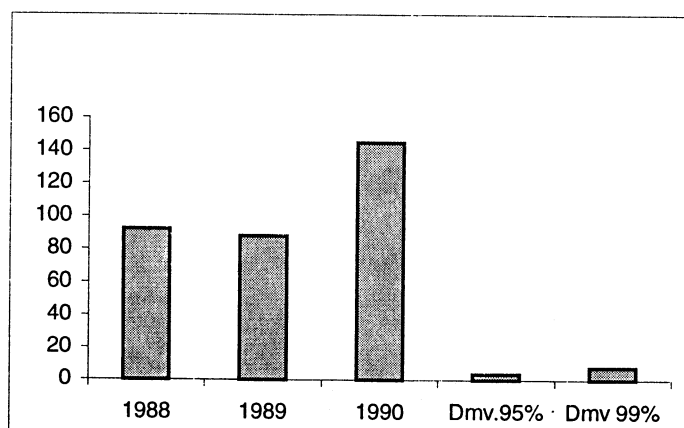
RESULTS AND DISCUSSION

In the course of the three investigated years were carried out a rank of observations, measurements of various biomorphological properties, yield and leaf quality, chemical content etc of he C-75 variety of the flue cured tobacco. Let's see briefly some main investigative date.

Length of the vegetation period

From the date of Graph 1 we could see that increase of the rainfall during the growing period lead to a shortening of the period transplanting-flowering i.e. speeds the growing and development processes. So in 1989 it was 78 days or 4.4% shorter than that of 1988 and is significant for 5% and 40% in the year 1990 and is significant for 1%. It is important to stress here the fact that on the length of vegetation influences not only the amount of the precipitation but and the moment when they rain. Generally, the rains of the first part of the vegetation when the tobacco plant has the critical period with regard to the water supply (the period of the active growth) have a great effect towards to shortening of the vegetation. This fact is clearly expressed on the date of this period during 1988 and 1990. Though in 1990 the absolute amount of the precipitation was greater than in 1988, the flowering in the last year was early carried out because it was rained mainly in the June when the plants have active period of growth, while in 1990 at that period there was not precipitation and therefore the plants for a long time stop the growth and development. So it increases the length of the vegetation period. This conclusion is similar to the investigations of the other authors (9,8).

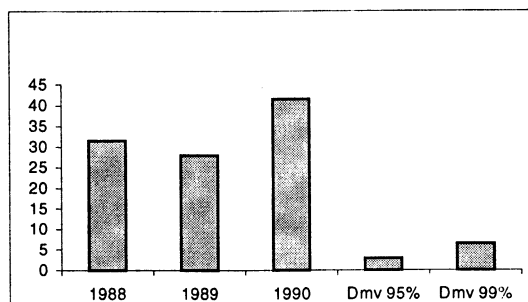
Graph. 1. Length of the vegetation period
Graf. 1. Dužina vegetacijskog razdoblja



Number of the leaves.

From experimental date and their statistical analysis result that under the influence of dry climate in 1990 and 1988 leaf number was significantly greater for 48.6 and 12.8%, respectively, as compared to the moderately moist climate in 1989. Generally, when we have precipitation in the period of active growth (as in 1989 and in 1988) the tobacco plants take a quick development and they give less leaves, whereas when it is dry (as in 1990) unsuitable conditions stop the plant's development and increase the vegetation period and bringing out of the leaves. Such conditions could lead on obtainment of high yield and good quality, but often those give small leaves with poor maturation and difficult drying.

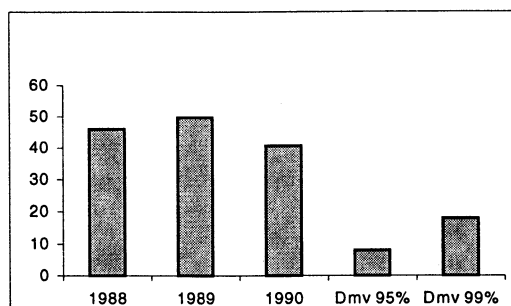
Graph. 2. Number of leaves
Graf. 2. Broj listova



The length of middle leaf.

The date of Graph 3 show that in 1988 the length of leaves of the middle belt was 8.3 and 22.7% greater than other two years (respectively in 1988 and 1990). It is significant for 5% in year 1990 and is not significant in year 1988. It is clear if we have in view precipitation period by Table 1 and the moment of the middle leaves growing.

Graph. 3. The length of the middle leaf (cm)
Graf. 3. Dužina srednjeg lista (cm)



The content of dry matter into leaf.

In dependence on the meteorological date, there were considerable differences in the amount of the dry matter (Table 2). Under the influence of the moist climate in 1988 and 1989 the content of dry matter (in the leaf of the middle belt) decreased for 31.5 and 29.7%, respectively, as compared to the warm dry climate in 1990. The differences of these indexes in the leaf of the top belt were less, respectively, 6.5 and 11.6%.

Table 2. Dry matter of the leaf (g/m²)
 Tablica 2. Suha tvar u listu (g/m²)

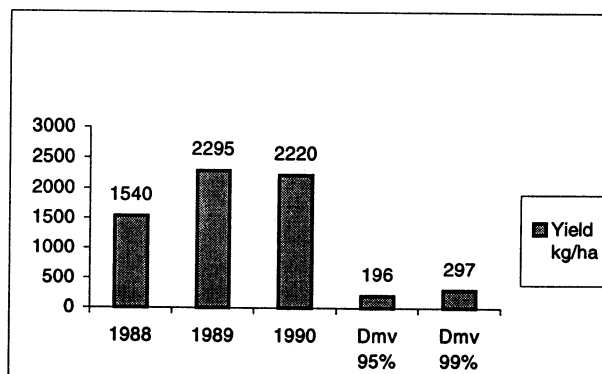
Year	Leaf	
	middle belt	top belt
1988	40.26	60.40
1989	41.32	57.09
1990	58.77	64.60

Yield and its quality.

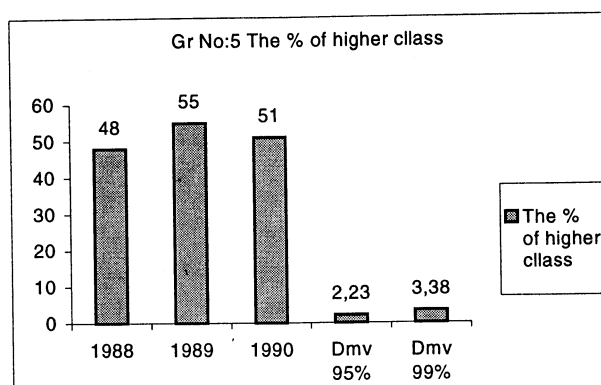
Since at the beginning ought to say that the yield obtained, in three investigated years, were low, as compared to biological capacity of this tobacco, because of unsuitable climatic conditions, first of all from the missing precipitation.

The date of Graph 4 and 5 show that under the influence of the moderately wet climate the Virginia tobacco gives relatively high and qualitative yield. So in 1989 it was 49% higher as compared to the year 1988 and 7% more of high classes and is significant for 1%, whereas in comparison with the year 1990 the yield had a low not significant increase (3.4%), but was more qualitative (4%) and is significant for 1%.

Graph. 4. The influence of the climatic conditions on the yield of the Virginia tobacco
 Graf. 4. Utjecaj klimatskih uvjeta na prinos Virginia duhana



Graph. 5. The percentage of higher class
Graf. 5. Postotak više klase



Chemical composition of the Virginia tobacco leaf

The chemical composition was determinant on the samples from the middle harvest. Table 3 shows the influence of the climatic conditions on chemical characteristics of cured Virginia tobacco leaf. Generally, the percentage of the total nitrogen, nicotine and other nitrogen matter decreased under the action of the moderately moist and warm climate in 1989, whereas the content of reducing sugar increased. From our data result that that in 1989 the percentage of the nicotine was 30% lower and reducing sugar 62% higher, respectively, than the value of year 1990.

Table 3. Chemical content of cured leaf
Tablica 3. Kemijski sastav doradenog lista

Year	Total N	Albumens	Nicotine	Reducing sugar
1989	1.04	6.5	2.1	14.1
1990	1.35	8.4	3.0	8.7

Such a fact speaks for a great important that have climatic conditions in generally, and particularly amount and distribution of precipitation, especially in the individual phases of Virginia tobacco development not only on the production but and its quality.

CONCLUSIONS

Based on the investigations carried out the following statements might be drawn :

In the region of Cerrik during the vegetation period the mean air temperature are adequate for high growth and development of tobacco Virginia

plant, but there is a little rainfall and its very irregular distribution. The results obtained show a significant effect of the precipitation in 1989 on the production of flue cured tobacco in terms of a higher yield of better quality, containing less nicotine and more reducing sugar than in other years with few precipitations.

In conclusion, it should be pointed out that the Virginia tobacco grown under this climatic conditions of insufficient precipitation is characterized by a relative low yield production and qualitative possibilities, so successful cultivation of this tobacco requires the application of irrigations.

UTJECAJ KLIMATSKIH UVJETA U REGIJI CERRIK NA BIOLOŠKA, PROIZVODNJA I KEMIJSKA SVOJSTVA FLUE-CURED DUHANA

SAŽETAK

Na pokusnom polju Duhanskog instituta Cerrik postavljen je pokus tijekom 1998-1990. godine u svrhu ispitivanja utjecaja klimatskih uvjeta u regiji Cerrik na duhan tipa Virginia. Posebna je pažnja posvećena morfološkim svojstvima, dužini vegetacijskog razdoblja, prinosu, kakvoći sirovog lista, te kemijskim svojstvima doradenog lista.

Tijekom trogodišnjih ispitivanja prosječne su se temperature u vegetacijskom razdoblju pokazale prikladnima za Virginia duhan, a količina i raspored oborina su nepovoljni. U 1989. godini bilo je 61 % više oborina nego u 1988. i 40 % više nego u 1990. U 1990. godini oborina je bilo približno kao i 1988, a njihov je raspored bio pravilniji.

Zbog klimatskih uvjeta prinos je u 1989. i u 1990. bio signifikantno viši nego u 1988. (49 % odnosno 44 % više). Dužina vegetacijskog razdoblja bila je signifikantno manja 1989. godine, dok broj listova je bio signifikantno viši u sušnim godinama (1988. i 1990). Dužina srednjeg lista bila je signifikantno veća 1989. godine. Kemijske analize doradenog lista pokazale su viši postotak nikotina i drugih dušičnih spojeva kao i niži postotak reducirajućih šećera u sušnoj 1990. godini nego u 1989.

Na temelju provedenih ispitivanja možemo zaključiti sljedeće:

- u regiji Cerrik tijekom vegetacijskog razdoblja prosječne temperature zraka su povoljne za brz rast i razvitak biljke Virginia duhana, no premalo je oborina, te oborine imaju nepravilan raspored,
- Virginia duhan uzgajan u uvjetima nedovoljnih oborina ima relativno male mogućnosti da postigne visok prinos i kakvoću tako da uspješna proizvodnja ovog tipa duhana zahtijeva navodnjavanje

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Adresa autora - Authors' address:
Dr. sc. Ferit Canllari
Tobacco Institute Cerrik
Cerrik
ALBANIJA

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