



## A Research on Herbal and Quality Properties of Lice Local Tobacco as Genetic Source<sup>#</sup>

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ARTICLE INFO	ABSTRACT
<p><sup>#</sup>This study was presented as an oral presentation at the 5th International Anatolian Agriculture, Food, Environment and Biology Congress (Tokat, TARGID 2020)</p> <p>Research Article</p> <p>Received : 09/10/2020 Accepted : 06/12/2020</p> <p>Keywords: Lice tobacco Tobacco genetic resources Oriental tobacco Local tobacco varieties Diyarbakır</p>	<p>Tobaccos produced in Turkey are grouped under different names according to the different environmental properties and various characteristics of the regions where they were grown. Lice tobacco is an important local tobacco variety cultivated under Lice-Hazro and Kulp districts conditions. In recent years, a large number of tobacco origin and village populations disappeared from production and faced the danger of extinction. Especially the Lice local tobacco variety has gained a very good adaptation ability against the stress factors of the region. Different environmental factors such as high altitude, stony areas and high temperature, low rainfall and low nitrogen soils have determined the important quality characteristics that distinguish Lice tobacco from other tobacco types. The short plant height and reverse conical plant shape in Lice Tobacco produced in Lice District and around of Diyarbakır draws attention firstly. In Lice tobacco, the number of leaves per plant is 15-17 pieces / plant, the ratio of the length of the leaves to the width (38 cm / 23 cm), the elliptical leaf blade, dark green leaves and plant color, early flowering, the petal color is pinkish red. It is a local variety with high cigarette yield, low nicotine ratio (1-2%), protein nitrogen ratio 1%, total reducing substance ratio 15%, and the highest alkaloid ratio. In this study, the plant and quality characteristics of the local Lice tobacco variety, which has a high degree of genetic diversity, were investigated in farmer conditions and the differences with other Eastern and Southeastern Anatolian tobacco varieties were tried to be revealed.</p>

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## Yerel Lice Tütününün Genetik Kaynak Olarak Bazı Bitkisel ve Kalite Özelliklerinin Araştırılması

MAKALE BİLGİSİ	ÖZ
<p>Araştırma Makalesi</p> <p>Geliş : 09/10/2020 Kabul : 06/12/2020</p> <p>Anahtar Kelimeler: Lice tütünü Tütün genetik kaynakları Oryantal tütün Yerel tütün çeşitleri Diyarbakır</p>	<p>Türkiye’de üretilen tütünler, çeşitli karakteristikleri ve yetiştirildikleri bölgelerin farklı ekolojik özelliklerine göre farklı isimler altında gruplandırılmıştır. Lice Tütünü Lice-Hazro ve Kulp ilçeleri koşullarında yetiştiriciliği yapılan önemli bir yerel tütün çeşididir. Son yıllarda çok sayıda tütün menşey ve köy popülasyonu üretimden kalkmış, yok olma tehlikesiyle karşı karşıya kalmıştır. Özellikle Lice yerel tütün çeşidi, yetiştiği bölgenin stres faktörlerine karşı çok iyi uyum ve adaptasyon yeteneği kazanmıştır. Yükseltinin fazla olduğu, taşlık alanlar ile yüksek sıcaklık, düşük yağış miktarı ve toprakların azot yönünden fakir olması gibi farklı çevresel faktörler, Lice tütün bitkisini diğer tütün tiplerinden ayıran önemli kalite özelliklerini belirlemiştir. Diyarbakır İli Lice İlçesi ve çevresinde üretimi yapılan Lice tütünündeki kısa bitki boyu, ters konik bitki şekli öncelikle dikkati çekmektedir. Lice tütününde bitki başına düşen yaprak sayısı 15-17 adet/bitki, yaprakların uzunluğunun genişliğine oranı (38 cm/23 cm), eliptik yaprak ayalı, koyu yeşil yaprak ve bitki rengi, çiçeklenmesi erken, taç yaprak rengi pembemsi kırmızıdır. Sigara verimi yüksek, nikotin oranı düşük (%1-2), protein azotu oranı %1’in altında, total indirgen madde oranı %,15 alkaloid oranı ise en yüksek olan yerel bir çeşittir. Bu araştırmada yüksek derecede genetik çeşitlilik içeren Lice yerel tütün çeşidinin çiftçi koşullarında bitkisel ve kalite özellikleri araştırılmış ve diğer Doğu ve Güneydoğu Anadolu tütün çeşitleriyle olan farklılıkları ortaya konulmaya çalışılmıştır.</p>

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## Introduction

Our country has diverse tobacco genetic resources. It is imperative to preserve this material for breeding programs and other research for now and the future. The necessity to preserve our national tobacco genetic resources is also crucial for tobacco to be ready according to the production and consumption tendencies of the population in the future.

It is also important to determine and preserve the diversity of the genetic resources of our tobacco resources, which are subjected to genetic erosion due to environmental and industrial pressures as well as uncertainties regarding production policies and social economy, in order to maintain the sustainability of our tobacco diversity.

Today, there are 25 different oriental tobacco (sun-cured) (*Nicotiana tabacum*) origins, which are referred to by the names of the regions where they are cultivated (Aegean, Marmara, Black Sea, South, Southeastern and Eastern Anatolia tobacco). In addition, “flue-cured” of the *N. tabacum* group and Hasankeyf origin of the *N. rustica* group are cultivated. Our tobaccos, which have always preserved their place in the world market in terms of blend and smoking qualities, show significant differences in morphological characteristics according to the regions where they are cultivated. As well as grouping Turkish tobacco according to the geographical regions where they are grown, the types that grow in the same region have significant differences in terms of origin (Anonymous, 2006).

Significant differences in soil and climate conditions in tobacco production regions have led to the formation of different origin tobaccos with high-quality values, which differ from each other with different characteristics in each region. There is a strong correlation between the quality values of oriental type tobacco origins and the ecological conditions of the regions where they are produced. Therefore, the concept of origin is always more important than the concept of variety in the Turkish tobacco market, and the tobaccos are generally named according to the production regions (Şenbayram et al., 2006). Even though the origins that are produced in different ecological conditions than their own production regions can preserve some morphological and biological characteristics, they are not able to preserve the characteristic commercial qualities such as leaf colour, size and odour, which are the reason why they are sought in the market (Sarıoğlu, 1980).

The richness of Turkish tobacco is both from climate and soil conditions, and the physical and chemical changes according to the drying style. In oriental tobacco production, factors such as climate, humidity, soil richness, and the dominant wind cause changes in the physical, chemical and technological content of the product even if the seed is the same. These are the factors that lead the oriental tobacco to be named after the region they are produced and that different tobacco types are called according to the origin (Lu et al., 2005).

The East Anatolia and Southeast Anatolia tobacco are different from other tobaccos of different regions in terms of physical and blend properties and reminds Virginia variety tobacco in terms of smell and smoking characteristics. There are many origins generated due to tobacco production in many remote places with different

ecological characteristics. In addition to small-sized webby butt varieties, there are big-sized small webby butt and webby butt varieties. The varieties are generally produced in populations, and they are grouped as Yayladağ, Malatya-Adıyaman, İskenderun, Diyarbakır-Siirt, Mardin, Muş, Bitlis ve Şemdinli populations. In addition, Tömbeki and Hasankeyf tobacco are also produced in the region (Apti, 1984).

This study aims to present the vegetative and quality characteristics of Lice local tobacco variety, whose genetic diversity is high, in farming conditions, and to determine the differences with other Eastern and Southeastern Anatolian tobacco varieties.

The second purpose of this study is to determine the yield and quality elements of Lice tobacco and the ecological, environmental factors that determine these elements and the effects of cultivation and drying techniques on tobacco yield and quality.

## Materials and Methods

The tobaccos from Diyarbakır Province, Lice Basin are named after the villages such as Halhal (Çitlibahçe), Licok (Çavundur), Zenge (Dolunay), Nenyas (Ortaç), Derun (Gökçen). The varieties are intensely cultivated in the south of Lice, in the eastern regions of Kocaköy district, and the basins in the northern regions of the Hazro district. Tobacco plants are mostly grown in mixed populations in these regions.

This study was conducted in 5 different farmlands where tobacco is cultivated during the 2020 growing season under Lice Basin farming conditions.

An average of 500 g to 700 g of seeds are planted per one decare of land. The seedling phase starts in March and continues until late April, and the seedlings are usually transplanted into the field from mid-May to late June. Seedling planting usually starts after 20th May and continues until the end of June. A “sap” is given after the seedlings are planted. The seedlings are anchored for the first time after the “sap” and watered and anchored 18 or 21 days again after the first sap. The leaves are developed within this period and reach 15-20 cm in size, and suckers are grown due to leaf development. These suckers are picked by hand. Then, the plant undergoes a tipping process. The watering continues after the tipping, and the plant is watered approximately 8 or 10 times until the harvest. The tipping enables the leaves that are left on the plant stem to be stronger, and become heavier by thickening, and to mature. The tobacco that is not tipped is for seeds.

The Lice tobacco is generally harvested between the end of August and September after a vegetation period of 90-100 days. The harvest of the products cultivated directly in the field starts typically at the beginning of August (Figure 1, 2, 3).

The tobacco is harvested manually, by plucking the leaves. The tobacco leaves are clustered to be ready to be bundled. One bundle consists of 4-5 leaves. Ropes varying between approximately 220 cm and 240 cm are cut and prepared to make bundles. One by one, the tobacco leaves are strung on threads 4 cm below the head. After the

harvest, the tobacco leaves are subject to a withering process for approximately 2.5-3 hours before being dried. The tobacco leaves on the string are placed on poles to dry. After drying, the tobacco leaves are well conditioned by sprinkling plenty of water on the bundles overnight and taken to the fermentation houses before sunrise. The fermentation place of the tobacco leaves is important. It, if possible, should be underground, humid and unventilated; if not, all the windows and the doors of the warehouse should be closed for ideal fermentation.

The soil characteristics of this basin are known as having high water absorption capacity (71-81%), being argillaceous, alkali, and low in salinity (0.03%), having neutral soil pH (7.2-7.7), being calcareous (1.70-14.31%) or moderate calcific, being rich in phosphorus (1.94-10.48 kg/da) and potassium (106.43 kg/da), and moderate in organic matter (1.05-1.91%). The tobacco production regions in Lice district are partly poor in nutrition elements, especially nitrogen.

Lice Basin is surrounded by mountains and has a typical continental climate. The total precipitation varies between 550-650 mm. It rains throughout the autumn, winter and spring, and the precipitation rate in summers is close to none.

The Lice tobacco, especially the one cultivated in Diyarbakir Province Lice District ecological conditions, has adapted well to the stress factors of the region. The most crucial ecological stress factors are high altitude, rocky areas, low precipitation, and the soil being poor in nitrogen. These different environmental factors played significant roles in determining the quality factors differentiating the tobacco plant from other tobacco varieties.

The plant characteristics such as plant size, number of leaves, the length of the leaf blade, the width of the leaf blade, and the thickness of the leaf of the Lice tobacco cultivated in 5 different farmlands were identified in this study. Nicotine (%), protein (%), total sugar (%), raw ash (%) analyses were conducted to determine the quality.

## Results and Discussion

It is important that all plants to be cultivated in aerated soils with good drainage, high water absorption capacity, availability of being irrigated, deep-profiled, and rich in terms of nutrition to have the maximum yield. The objective of the Lice Halhal production is to obtain high-quality leaves rather than having a high yield. It is essential to ensure the formation of the stress factors mentioned above and allow the changes that occur as a result of the adaptation of the plant in this environment to occur as quickly and strongly as possible, to grow high-quality tobacco.

Even though the low nitrogen value in the soil had a positive effect on the quality, the water absorption capacities of these areas and this factor being beneficial to the plant are the main points to be considered. The saturation ratio varying between 71-81% shows that the soil is heavily calcific. Plants increase the water movement from the rhizosphere to the root body, thus increasing the nutrient uptake rate, generally by making rapid transpiration provided that there is sufficient water in the soil.



Figure 1. Diyarbakir city, Lice town, Halhal village tobacco



Figure 2. A view of Halhal village tobacco before harvesting



Figure 3. General view of Halhal Village tobacco at maturation period

Nitrogen that has a vital role in plant development also constitutes an important part of the dry matter of plants. Nitrogen is the most crucial nutrient element for plant nutrition for its role in the metabolic activities, as well as its high content in the plant. The leaves turn dark green due to sufficient nitrogen intake from the soil, and the plant shows a strong vegetative development. If the nitrogen lacks, the plants are yellow and short. However, low nitrogen application develops the roots faster than the high nitrogen application. Even though the roots grow faster, the synthesis of components consisting of nitrogen, such as nicotine is affected negatively from the low nitrogen application (Kacar, 1984).

Even though the high nicotine amount in oriental tobacco is an important indicator of quality, it is an unwanted characteristic. The conducted research revealed the high linear relationship between the nicotine amount (especially in the young leaves) and the nitrogen doses introduced to the tobacco plant.

Table 1. General Plant Characters of Lice Tobacco

Tobacco plant parts	TPP
1. Plant: Shape	Inverted conical
2. Plant: Size	Short
3. Plant: Main stem color	Dark green
4. Plant: Leaf count	Few
5. Plant: Tendency to grow suckers	Strong
6. Leaf: Type	Conjoint
7. Leaf: Angle with the stalk	Middle right
8. Leaf: Blade length (except auricles)	Very long
9. Leaf: Blade width	Large
10. Leaf: Ratio of length to width	Wide
11. Leaf: The width of the part where the leaf meets the stalk (varieties without a stalk only) (Width of the sessile)	Wide
12. Leaf: The thickness of the strings	Thick
13. Leaf: Angle of the lateral veins to midrib	Flat
14. Leaf: The shape of the leaf blade	Wide elliptic
15. Leaf: The shape of the tip	Medium pointed
16. Leaf: Latitude profile	Concave
17. Leaf: Longitudinal profile	Medium curled
18. Leaf: Blistering of leaf blade	Medium
19. Leaf: Undulation of margin	Strong
20. Leaf: Development of auricles	Very strong
21. Leaf: Color of the leaf blade	Dark green
22. Leaf: The color of the midrib on lower side	Green
23. Blooming Period %50 ç.g.s	Early
24. Flower: Length (except pedicle)	Medium
25. Flower: Diameter of the tube (just above the calyx)	Medium
26. Flower: Swelling of the tube	Medium
27. Flower: Size of corolla	Big
28. Flower: Pointedness of the corolla	Very strong
29. Flower: Color of the corolla	Red
30. Flower: Development of stamens	Completed
31. Flower: The length of pistil according to stamen	Equal
32. Flower: Shape	Spherical
33. Flower: Condition according to upper leaves	In the middle
34. Flower: Compactness	Compact
35. Fruit: Form	Like an egg

TPP: Tobacco parts properties, Source: Phenotyping data standards and Scala values of tobacco, Yilmaz, 2018. UPOV (International Union for the Protection of new Varieties of Plant)

Table 2. Several plant and chemical values measured in Lice Tobacco

Tobacco properties	PVT
Number of Leaves Per Plant (Pieces)	8-17
Leaf Length (cm)	25-40
Leaf Width	15-30
Plant Length (cm)	65-140
4. Nicotine Ratio (%)	0.7-1.2
5. Protein Ratio (%)	Lower than 1
6. Total Reducing Substance Ratio (%)	15

PVT: Properties values of Tobacco

On the other hand, Lice Halhal Tobacco stands out with its low nicotine ratio (approximately 1-2%). Its low nicotine ratio is due to the plants being cultivated in soils that are barren, rocky, and poor in organic matter. Another factor affecting the nicotine level in tobacco is tipping.

The nicotine level of Lice Halhal tobacco is shallow compared to other tobacco varieties, at 1-2% (Table 2). Its

remarkable characteristics are soft smoking quality, slightly sweet taste, and especially the fragrant aroma.

In addition, another chemical quality of the Lice Halhal Tobacco is the high sugar ratio of the dried leaves. Mainly sucrose and fructose play essential roles in Turkish tobacco aromas. Another study revealed the high negative correlation between the nitrogen and starch amount according to the quality groups (Sekin, 1995). It was revealed that high-quality tobacco had more starch than low-quality tobacco. Reducing sugars have positive effects on the quality of tobacco.

When the physical structures are examined, as the length of the leaves after the tipping process is approximately 25-30 cm in the upper hands, 30-40 cm in the primings, and the width of the leaves is 15-20 cm in the upper hands, and 17-30 cm in the primings, the leaves are considered as big (Table 2). The part where the leaf blade connects to the stem does not have a stalk; thus the leaf blade is directly on the sole. When the fermentation is completed, the colour is between bright maroon and its reddish hues. The leaf structure is thick, its durability level is durable, and the flexibility level is low. Lice Halhal tobacco finds more customers in the domestic market. The height of the plant is approximately 60-140 cm. One plant yields 8 to 17 leaves, and the yield per one decare is approximately 200 kg (Table 2).

It is a local variety that is mostly used for hand-rolled cigarettes, with short plant height and inverted conical plant shape; it has few numbers of leaves per plant, with long and wide dark green leaves that have elliptical leaf blades, the plant and its leaves are dark green, it flowers early. It has pinkish-red petal color yielding high cigarette, and that has the highest rate of alkaloids (Table 1).

## Conclusion

As a result of the denaturalization practices in Turkey, both the number of origins and the production has decreased considerably of our tobacco varieties, each of which carrying important blend values.

Cigarette blending technology is carried out by mixing tobacco with different characteristics in each country in specific proportions to create a composition suitable for the demands of the market and adding some additives. Only blends of Eastern tobacco varieties are used in producing Turkish cigarettes, and these blends do not contain additives. Turkish varieties act like a regulator for American blend-cigarettes and create a compatible composition for oriental blends. Even though the Turkish genotypes of tobacco, which are examined about their places in the blending technology, have sizeable biological diversity, it is seen that there has been a significant decrease both in quantity and amount. Considering the changing demands of the sector, it is of great importance to protect this genetic richness, to make regular production renewals, to keep it ready for the use of researchers and the sector.

Halhal tobacco plant, grown in ecological conditions of Lice district, has adapted to the stress factors of the region where it is cultivated. These environmental factors have identified the important quality characteristics that distinguish the Halhal tobacco variety from other tobacco types. The objective of the Lice Halhal tobacco production

is to obtain high-quality leaves rather than having high yield. It is essential to ensure the formation of the stress factors and allow the changes that occur as a result of the adaptation of the plant in this environment to occur as quickly and strongly as possible to grow high-quality tobacco

The lands on which tobacco is grown in Lice District are partially poor in nutrient elements, especially nitrogen. The soil in Lice is rocky and not deep. The altitude is high, and the area shows typical highland characteristics.

Lice Halhal Tobacco stands out with its low nicotine ratio. Its low nicotine ratio is due to the plants being cultivated in soils that are barren, rocky and poor in organic matter. In addition, another chemical quality of the Lice Halhal Tobacco is the high sugar ratio of the dried leaves.

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