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RESEARCH ARTICLE

Prevalence of Green Tobacco Sickness in Tobacco Production Areas in the Black Sea Region

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ABSTRACT: The purpose of this study was to examine the presence of green tobacco sickness in tobacco producers living in the Black Sea Region and their level of knowledge of green tobacco sickness. Simple random sampling was employed, and the results of the surveys that had been conducted face-to-face with tobacco producers were gathered and analyzed. As a result, green tobacco sickness was not encountered among tobacco producers living in the Black Sea Region, and it was understood that they did not have knowledge of the sickness. The main reasons why there is no evidence of the sickness are growing tobacco with low nicotine content and common usage of protective equipment during and after harvest. In order to overcome lack of information, occupational health and safety training should be provided. In addition, it is required to make agricultural mechanization widespread in tobacco growing. Thus, precautions shall have been taken against probable occurrence of the sickness. Making this study in other tobacco production regions of Turkey would be beneficial.

Keywords: Green tobacco sickness, oriental, *Nicotiana tabacum* L., nicotine, prevalence

INTRODUCTION

Being more important than other agricultural products in terms of production, usage, and foreign trade, tobacco has been a matter of debate both in our country and in the world in recent years especially due to its adverse effects on health and its economic return. Tobacco is an annual agricultural product generally useful with its cured leaves. In the world, different types of tobacco are cultivated depending on different ecological conditions and microclimates. In the world's tobacco production, Virginia, Burley and Maryland, and Oriental are the leading tobacco types with a share of 70%, 15%, and 4%, respectively. They are followed by tobacco types such as Puroluk, Kentucky, Havana, Beneventeno, etc. Approximately 97% of the tobacco grown in Turkey is Oriental, followed by Virginia, Burley, Tömbeki, and Hasankeyf (TAPDK, 2013).

Green tobacco sickness occurs as nicotine dissolves during transplanting, hoeing, harvesting, stacking, and curing and is absorbed by skin (Mcbride *et al*., 1998; Arcury TA, 2006). By some researches, it is defined as nicotine poisoning resulting from the absorption of nicotine by skin (Quandt et *al*., 2001; Arcury *et al*., 2003). The sickness was reported in the medical literature for the first time in 1970 by Weizenecker and Deal (Karafakoglu 2004). During harvest, tobacco producers break off mature leaves and carry them under their armpits. They rarely use protective equipment such as gloves by the reason that it makes harvesting more difficult. As a result, especially tobacco producers' hands are exposed to nicotine. During harvest, which is performed mostly in the early morning, tobacco producers' clothes are moistened by the dew that accumulates on leaves. It is thought that, dissolved by dew and absorbed by skin, nicotine causes the symptoms of green tobacco sickness. The symptoms of green tobacco sickness resemble to those of nicotine poisoning observed in new smokers (Karafakoglu 2004). They include weakness, headache, nausea, vomiting, dizziness, abdominal cramps, breathing difficulty, abnormal temperature, pallor, diarrhea, chills, fluctuations in blood pressure or heart rate, and increased perspiration and salivation (Mcbride *et al*., 1998; Gehlbach *et al*., 1974; Ballard et *al*., 1995; Arcury *et al*., 2001; Trape-cardoso *et al*., 2003).

The onset of the sickness is 3-17 hours after nicotine absorption. The duration of the sickness is 1-3 days (Mcbride *et al*., 1998). For some researchers, it progresses within 1-6 hours after symptoms occur and ends within 6-24 hours (Karafakoglu 2004). Change of clothing, taking a shower, fluid intake, and rest are recommended as initial treatment. In extreme cases, it is necessary to seek medical help (intravenous rehydration, anti-emetics and dimenhydrinate). Water-resistant protective clothing such as gloves, boots, and socks may reduce the risks (Mcbride *et al*., 1998). Skin lesions such as rash, incision, and abrasion may increase the likelihood of skin absorption and green tobacco sickness. The level of nicotine absorption by skin may be higher in sick skin than healthy skin (Wester RC, 1983; Benowitz 1987).

According to the results of the research conducted on 685 Flue Cured Virginia (FCV) tobacco producers in India, the prevalence of green tobacco sickness in tobacco workers is 47% (55,7% in women, 42,66% in men) (Parikh *et al*., 2005). In a research of the nicotine residue on the hands of the workers working at different parts of the FCV tobacco harvesting machine and the removal of such residue by washing hands at different times and in different manners, it was reported that the mean pre-wash and post-wash nicotine levels were 10 and 0.38 mg cm^2, respectively. It was found that working on the bottom, rather than the top, of the tobacco harvesting machine was directly associated with the amount of nicotine residue and that washing hands with soap and water right after the completion of work reduced nicotine residue levels on hands by approximately 96% (Curwin *et al*., 2005). It is indicated that the risk of getting green tobacco sickness is higher for younger tobacco workers [Ballard *et al*., 1995; Gehlbach et *al*., 1979).

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In their studies, some researchers defined green tobacco sickness in farmers and agricultural laborers in different regions of the US (Florida, North Carolina, Kentucky, Tennessee, and Connecticut), Japan, India, and Italy (Ballard *et al*., 1995; Arcury *et al*., 2001; Trape-cardoso *et al*., 2003; Weizenecker, 1970; Gehlbbach *et al*., 1975; Ghosh *et al*., 1979; Misumi *et al*., 1989; D'Alessandro *et al*., 2001; Arcury *et al*., 2001). (Arcury *et al*., 2001; Arcury *et al*., 2001) report the incidence density of green tobacco sickness in Latino farmworkers in North Carolina as 1.88 days in 100 days and the prevalence in agricultural season as 24%. In the study conducted in North Carolina, 18.4% of the tobacco harvesters were diagnosed with green tobacco sickness, and rash and abrasions were found to be directly associated with green tobacco sickness (Arcury *et al*., 2008).

As tobacco production continues, the frequency of green tobacco sickness shall increase among tobacco workers and producers (Arcury TA, 2006; Chacha BK, 2002). For this reason, it is necessary to know the risks posed by the sickness and to determine its prevalence. This study aims to summarize the socio-economic status of tobacco producers living in the Black Sea Region and to ascertain the awareness and prevalence of green tobacco sickness among them.

EXPERIMENTAL SECTION

The data which is obtained from face-to-face interviews with tobacco producers forms the material of this study. The results of the surveys prepared accordingly and made face-to-face with tobacco producers were gathered and analyzed.

The area of study was determined to be the districts of the Black Sea Region which had the highest number of tobacco producers and the highest amount of tobacco production according to the 2012 production year contracts (Table 1). In the study, the number of tobacco producers to take part in the survey was determined to be 296, using simple random sampling method (Cicek, 1996).

$$N=\frac{(N*(S)^2*t^2)}{((N-1)d^2+(S)^2*t^2)}$$

Data was collected by visiting 4 districts and conducting face-to-face interviews with tobacco producers. Survey results were analyzed on SPSS 17.0; data was presented as crosstabs and a correlation table.

RESULTS AND DISCUSSION

Tobacco is a social plant because all family members contribute to the process of cultivation (seedbed period, transplanting, hoeing, harvesting, stacking, curing, boxing, and storage). In the study, it was found that all family members contributed to tobacco production. In 61.8% of the establishments analyzed, the number of family members varied between 4 and 6. 58.9% of the household heads were below the age of 50. 96.3% of them were married. 16.2% of them were female. The share of illiterate tobacco producers was 6.4%. 0.6% of all tobacco producers were undergraduates. 74.7% of the household heads were primary school graduates. The data proves that the level of education of tobacco producers is low. It was understood that 75% of the tobacco producers in the region had engaged in tobacco production for more than 20 years and more, and 80.1% did not have any source of income other than tobacco. In spite of the search for an alternative to tobacco production in the rural area, tobacco remains to be the most significant source of income for the local community (Table 2).

Pesticides used in tobacco often pose hazard to the health of tobacco producers and workers. Tobacco workers come into contact with such chemicals during work. It is as dangerous as exposure to nicotine [Karafakoglu YS, 2004; Ballard T *et al*., 1995). For this reason, in our study, establishments were asked about pesticide application, frequency of application, method of application, compliance with directions for use, and factor in deciding the time from harvesting to application. In the study, it was found that a great majority of the tobacco producers (91.6%) applied pesticides. 70.9% of them applied pesticides 1 to 2 times during production season. 80.8% of the tobacco producers applied pesticides using pipes or backpack sprayers. 72.8% of them decided to apply pesticides taking the recommendations of their contracted tobacco company official into consideration. In tobacco production, both the right dose of application and the right time of application are the keys to minimize environmental damage as well as damages to tobacco producers and workers. Only 3.7% of the tobacco producers took that decision by themselves; 87.9% of them made dose decisions by reading the directions for use or consulting to the Provincial Directorate of Agriculture, pesticide vendors, or tobacco company officials. 8.4% of them did not applied pesticides at all. One of the most frequent problems in tobacco production areas was non-compliance with time of waiting after pesticide application. In this study, although 50.5% of the tobacco producers stated they complied with such time with applicable methods, it was understood that 40.8% of them still decided on the time of entering the land after pesticide application based on their experience, without need for any guidance (Table 3). Tobacco having residue over tolerance limits does not have any commercial value, not to mention its adverse effects on health. So, it is absolutely necessary to observe the dose of application and the time of waiting written on labels.

Green tobacco sickness occurs as nicotine on tobacco leaves is absorbed as a result of contact with skin. The key factors that help nicotine absorption are failure to use protective equipment, breaking off tobacco leaves when they have dew on them, and collecting tobacco leaves under armpits. In the study conducted in the region, it was ascertained that, of the tobacco producers, 99% did not harvest in rainy weather, 91% did not harvest in case of dew, 35% harvested when the height of tobacco was at waist level, 41% harvested when the height of tobacco was at chest level, 89.5% used protective equipment, and 61% carried harvested tobacco leaves mostly in a basket. It was found that, in general, tobacco producers did not have breakfast before harvest (82%) or snacked during harvest (84%) (Table 4).

It was seen that almost all (96.4%) of the tobacco farmers in the region had not ever heard of green tobacco sickness and that, after harvest, a great majority (96.6%) of them had not ever encountered such a sickness. The ones who thought tobacco production had adverse effects on their health were in minority (16.2%). The majority (83.8%) of them thought the opposite (Table 5).

In the study, an inverse and statistically significant ($p<0.01$) relationship was observed between the method of application and the application of pesticides. The relationship between snacking during harvest and the height of tobacco leaves during harvest and harvesting after rainfall or dew was found to be a direct relationship. On the contrary, there was an inverse and statistically significant ($p<0.01$) relationship between snacking during harvest and protective equipment usage during harvest. In other words, it was seen that the tobacco producers who used protective equipment did not snack during

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harvest. However, as the height of tobacco leaves during harvest increased and harvesting after rainfall or dew became more frequent, tobacco producers snacked more during harvest. An inverse relationship was observed between the height of tobacco leaves during harvest and having heard of green tobacco sickness, the adverse effects of tobacco cultivation on health, and protective equipment usage during harvest. On the other hand, the relationship between the height of tobacco leaves during harvest and tobacco leaf stringing was directly proportional. In addition, an inverse and statistically significant ($p<0.01$) relationship was observed between having heard of green tobacco sickness and tobacco leaf stringing. As can be seen in the results obtained, the less tobacco producers come into contact with green tobacco, the less they have/hear of green tobacco sickness (Table 6).

CONCLUSIONS

The researches performed all around the world report that green tobacco sickness exists and leads to some negative effects on tobacco producers. The Black Sea Region is one of those having the highest amount of tobacco production in Turkey. The purpose of this study was to examine the presence of green tobacco sickness in the region and tobacco producers' level of knowledge of green tobacco sickness.

As a result of the study, no green tobacco sickness was encountered among tobacco producers living in the Black Sea Region. Black Sea Region tobacco producers do not harvest on rainy days. They have protective equipment during harvest and generally use baskets for carrying tobacco leaves. In addition, oriental tobacco contains low amount of nicotine. These are the main reasons why green tobacco sickness was not encountered in the region. Additionally, it was understood that tobacco producers living in the region did not have knowledge of green tobacco sickness. Thus, it is required to inform them about the symptoms and risks of green tobacco sickness and give occupational health and safety training to them. For protecting the health of individuals working in tobacco production, it is of high importance to conduct national and international campaigns intended to raise public awareness of green tobacco sickness. Besides, we believe that attempts to perform tobacco harvest by mechanical methods and technical equipment would be helpful in solving the problems caused by using hands. It is necessary to repeat this study conducted in the Black Sea Region in other tobacco producing parts of Turkey as well. We think that, in future studies, relevant medical academics should be included in the team to determine the amount of nicotine absorbed, performing pre- and post-harvest measurements, and results should be incorporated into considerations.

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List of Tables:

Table 1. Tobacco production in the Black Sea Region and in the area of study

	Number of Producers *	Contract Amount (kg)*	Area of Production (da^{-1})*	Number of Surveys
Alaçam / Samsun	1.496	1.902.750	17.355	59
Bafra / Samsun	3.753	5.227.300	46.162	149
Erbaa / Tokat	1.794	2.514.650	25.122	71
Gümüşhacıköy / Amasya	420	355.550	3.060	17
Karadeniz Bölgesi	10.084	12.094.100	110.106	296
Turkey	63.156	83.464.900	1.020.354	

*Source: [1]

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Table 2. Some socio-economic features of tobacco producers

Regions	Alaçam		Bafra		Erbaa		G.Hacıköy		Total	
Variables	*Freq.*	*Perc.*	*Freq.*	*Perc.*	*Freq.*	*Perc.*	*Freq.*	*Perc.*	*Freq.*	*Perc.*
Number of Households										
1---3	1	0.3%	16	5.4%	7	2.4%	1	0.3%	25	8.4%
4---6	36	12.2%	98	33.1%	39	13.1%	10	3.4%	183	61.8%
7---9	22	7.4%	29	9.8%	20	6.8%	4	1.4%	75	25.4%
10 < ---	0	0.0%	6	2.0%	5	1.7%	2	0.7%	13	4.4%
Total	**59**	**19.9%**	**149**	**50.3%**	**71**	**24.0%**	**17**	**5.8%**	296	100.0%
Gender										
Male	53	17.9%	124	41.9%	59	19.9%	12	4.1%	248	83.8%
Female	6	2.0%	25	8.4%	12	4.1%	5	1.7%	48	16.2%
Total	**59**	**19.9%**	**149**	**50.3%**	**71**	**24.0%**	**17**	**5.8%**	296	100.0%
Age										
15---49	37	12.4%	84	28.3%	43	14.5%	11	3.7%	175	58.9%
50---65	15	5.1%	55	18.6%	26	8.8%	4	1.4%	100	33.9%
65 < ---	7	2.4%	10	3.4%	2	0.7%	2	0.7%	21	7.2%
Total	**59**	**19.9%**	**149**	**50.3%**	**71**	**24.0%**	**17**	**5.8%**	296	100.0%
Educational Background										
Illiterate	7	2.4%	9	3.0%	1	0.3%	2	0.7%	19	6.4%
Literate	2	0.7%	6	2.0%	0	0.0%	1	0.3%	9	3.0%
Primary School	43	14.4%	106	35.9%	63	21.3%	9	3.1%	221	74.7%
Secondary School	4	1.4%	19	6.4%	4	1.4%	3	1.0%	30	10.2%
High School	2	0.7%	8	2.7%	3	1.0%	2	0.7%	15	5.1%
Undergraduate	1	0.3%	1	0.3%	0	0.0%	0	0.0%	2	0.6%
Total	**59**	**19.9%**	**149**	**50.3%**	**71**	**24.0%**	**17**	**5.8%**	296	100.0%
Non-Agricultural Income										
Yes	17	5.7%	27	9.1%	13	4.4%	2	0.7%	59	19.9%
No	42	14.2%	122	41.2%	58	19.6%	15	5.1%	237	80.1%
Total	**59**	**19.9%**	**149**	**50.3%**	**71**	**24.0%**	**17**	**5.8%**	296	100.0%
Non-Tobacco Income										
0%	42	14.2%	122	41.1%	58	19.6%	15	5.2%	237	80.1%
10-30%	10	3.4%	12	4.1%	5	1.7%	1	0.3%	28	9.5%
31-60%	6	2.0%	12	4.1%	7	2.4%	1	0.3%	26	8.8%
61-80%	1	0.3%	3	1.0%	1	0.3%	0	0.0%	5	1.6%
Total	**59**	**19.9%**	**149**	**50.3%**	**71**	**24.0%**	**17**	**5.8%**	296	100.0%

Freq.: Frequence, Perc.: Percent

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Table 3. Pesticide application by tobacco producers and factor in deciding to do so

Regions	Alaçam		Bafra		Erbaa		G.Hacıköy		Total	
Variables	*Freq.*	*Perc.*	*Freq.*	*Perc.*	*Freq.*	*Perc.*	*Freq.*	*Perc.*	*Freq.*	*Perc.*
Pesticide Application										
Yes	58	19.6%	129	43.5%	70	23.7%	14	4.8%	271	91.6%
No	1	0.3%	20	6.8%	1	0.3%	3	1.0%	25	8.4%
Total	**59**	**19.9%**	**149**	**50.3%**	**71**	**24.0%**	**17**	**5.8%**	296	100.0%
Number of Applications										
0	1	0.3%	20	6.8%	1	0.3%	3	1.0%	25	8.4%
1 time	11	3.7%	38	12.7%	13	4.4%	12	4.1%	74	24.9%
2 times	21	7.1%	66	22.3%	47	15.9%	2	0.7%	136	46.0%
3 times	23	7.8%	21	7.1%	8	2.7%	0	0.0%	52	17.6%
4 times	3	1.0%	4	1.4%	2	0.7%	0	0.0%	9	3.1%
Total	**59**	**19.9%**	**149**	**50.3%**	**71**	**24.0%**	**17**	**5.8%**	296	100.0%
Method of Application										
Not applying	1	0.3%	20	6.8%	1	0.3%	3	1.0%	25	8.4%
Life water	0	0.0%	10	3.4%	1	0.3%	4	1.4%	15	5.1%
Pump	30	10.1%	53	17.9%	11	3.8%	2	0.7%	96	32.5%
Backpack Sprayer	26	8.8%	59	19.9%	53	17.9%	5	1.7%	143	48.3%
Spraying Machine	2	0.7%	6	2.0%	4	1.4%	3	1.0%	15	5.1%
Other	0	0.0%	1	0.3%	1	0.3%	0	0.0%	2	0.6%
Total	**59**	**19.9%**	**149**	**50.3%**	**71**	**24.0%**	**17**	**5.8%**	296	100.0%
Factor in Deciding on Application										
Not applying	1	0.3%	20	6.8%	1	0.3%	3	1.0%	25	8.4%
Based on his/her experience	0	0.0%	9	3.0%	10	3.4%	0	0.0%	19	6.4%
Recommendation of the Provincial Directorate of Agriculture	0	0.0%	5	1.7%	1	0.3%	1	0.3%	7	2.3%
Recommendation of Pesticide Vendor	1	0.3%	17	5.7%	12	4.1%	0	0.0%	30	10.1%
Recommendation of Tobacco Company	57	19.3%	98	33.1%	47	15.9%	13	4.5%	215	72.8%
Total	**59**	**19.9%**	**149**	**50.3%**	**71**	**24.0%**	**17**	**5.8%**	296	100.0%
Factor in Deciding on Dosage										
Not applying	1	0.3%	20	6.8%	1	0.3%	3	1.0%	25	8.4%
Directions for Use	4	1.4%	6	2.0%	13	4.4%	0	0.0%	23	7.8%
Based on his/her experience	0	0.0%	9	3.0%	2	0.7%	0	0.0%	11	3.7%
Recommendation of the Provincial Directorate of Agriculture	0	0.0%	3	1.0%	0	0.0%	1	0.3%	4	1.3%
Recommendation of Pesticide Vendor	15	5.1%	38	12.8%	30	10.2%	0	0.0%	83	28.1%
Recommendation of Tobacco Company	39	13.1%	73	24.7%	25	8.4%	13	4.5%	150	50.7%
Total	**59**	**19.9%**	**149**	**50.3%**	**71**	**24.0%**	**17**	**5.8%**	296	100.0%
Factor in Deciding on Post-Application Harvest										
Not applying	1	0.3%	20	6.8%	1	0.3%	3	1.0%	25	8.4%
Directions for Use	25	8.4%	20	6.8%	33	11.1%	3	1.0%	81	27.3%
Based on his/her experience	14	4.8%	76	25.6%	22	7.4%	9	3.0%	121	40.8%
Other	19	6.4%	33	11.1%	15	5.2%	2	0.8%	69	23.5%
Total	**59**	**19.9%**	**149**	**50.3%**	**71**	**24.0%**	**17**	**5.8%**	296	100.0%

Freq.: Frequence, Perc.: Percent

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Table 4. Some harvesting period behaviors which may cause green tobacco sickness

Regions	Alaçam		Bafra		Erbaa		G.Hacıköy		Total	
Variables	*Freq.*	*Perc.*	*Freq.*	*Perc.*	*Freq.*	*Perc.*	*Freq.*	*Perc.*	*Freq.*	*Perc.*
Pre-Harvest Breakfast										
Yes	13	4.4%	14	4.7%	22	7.4%	4	1.4%	53	17.9%
No	46	15.5%	135	45.6%	49	16.6%	13	4.4%	243	82.1%
Total	**59**	**19.9%**	**149**	**50.3%**	**71**	**24.0%**	**17**	**5.8%**	296	100.0%
Snacking during Harvest										
Yes	2	0.7%	9	3.0%	30	10.1%	4	1.4%	45	15.2%
No	57	19.2%	140	47.3%	41	13.9%	13	4.4%	251	84.8%
Total	**59**	**19.9%**	**149**	**50.3%**	**71**	**24.0%**	**17**	**5.8%**	296	100.0%
Harvesting in Rainy Weather										
Yes	0	0.0%	0	0.0%	2	0.7%	1	0.3%	3	1.0%
No	59	19.9%	149	50.3%	69	23.3%	16	5.5%	293	99.0%
Total	**59**	**19.9%**	**149**	**50.3%**	**71**	**24.0%**	**17**	**5.8%**	296	100.0%
Harvesting in Case of Dew, Moisture, etc.										
Yes	1	0.3%	2	0.8%	18	6.1%	3	1.0%	24	8.2%
No	58	19.6%	147	49.5%	53	17.9%	14	4.8%	272	91.8%
Total	**59**	**19.9%**	**149**	**50.3%**	**71**	**24.0%**	**17**	**5.8%**	296	100.0%
Plant Height During Harvest										
Under-Waist Level	1	0.3%	1	0.3%	9	3.0%	1	0.3%	12	3.9%
Waist Level	11	3.7%	37	12.5%	53	18.0%	3	1.0%	104	35.2%
Chest Level	38	12.9%	64	21.6%	9	3.0%	10	3.5%	121	41.0%
Head Level	6	2.0%	31	10.5%	0	0.0%	2	0.7%	39	13.2%
Overhead Level	3	1.0%	16	5.4%	0	0.0%	1	0.3%	20	6.7%
Total	**59**	**19.9%**	**149**	**50.3%**	**71**	**24.0%**	**17**	**5.8%**	296	100.0%
Protective Equipment During Harvest										
Yes	51	17.2%	145	48.9%	52	17.6%	17	5.8%	265	89.5%
No	8	2.7%	4	1.4%	19	6.4%	0	0.0%	31	10.5%
Total	**59**	**19.9%**	**149**	**50.3%**	**71**	**24.0%**	**17**	**5.8%**	296	100.0%
Method of Carrying Harvested Tobacco Leaves										
By Hand	8	2.7%	47	15.9%	12	4.1%	8	2.8%	75	25.5%
Under Armpit	0	0.0%	40	13.5%	0	0.0%	0	0.0%	40	13.5%
Basket	51	17.2%	62	20.9%	59	19.9%	9	3.0%	181	61.0%
Total	**59**	**19.9%**	**149**	**50.3%**	**71**	**24.0%**	**17**	**5.8%**	296	100.0%
Collecting under Armpit										
Yes	37	12.5%	86	29.1%	54	18.2%	15	5.1%	192	64.9%
No	22	7.4%	54	18.2%	16	5.5%	2	0.7%	94	31.8%
Sometimes	0	0.0%	9	3.0%	1	0.3%	0	0.0%	10	3.3%
Total	**59**	**19.9%**	**149**	**50.3%**	**71**	**24.0%**	**17**	**5.8%**	296	100.0%

Freq.: Frequence, Perc.: Percent

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Table 5. Recognition and prevalence of green tobacco sickness among tobacco producers

Regions	Alaçam		Bafra		Erbaa		G.Hacıköy		Total	
Variables	*Freq.*	*Perc.*	*Freq.*	*Perc.*	*Freq.*	*Perc.*	*Freq.*	*Perc.*	*Freq.*	*Perc.*
Post-Harvest Sickness										
Yes	0	0.0%	8	2.7%	2	0.7%	0	0.0%	10	3.4%
No	59	19.9%	141	47.6%	69	23.3%	17	5.8%	286	96.6%
Total	**59**	**19.9%**	**149**	**50.3%**	**71**	**24.0%**	**17**	**5.8%**	296	100.0%
Applying to the Hospital in Case of Sickness										
Yes	0	0.0%	1	0.3%	1	0.3%	0	0.0%	2	0.6%
No	59	19.9%	148	50.0%	70	23.7%	17	5.8%	294	99.4%
Total	**59**	**19.9%**	**149**	**50.3%**	**71**	**24.0%**	**17**	**5.8%**	296	100.0%
Have you ever heard of green tobacco sickness?										
Yes	1	0.3%	9	3.0%	1	0.3%	0	0.0%	11	3.6%
No	58	19.6%	140	47.3%	70	23.7%	17	5.8%	285	96.4%
Total	**59**	**19.9%**	**149**	**50.3%**	**71**	**24.0%**	**17**	**5.8%**	296	100.0%
Does tobacco production affect health adversely?										
Yes	7	2.4%	29	9.8%	11	3.7%	1	0.3%	48	16.2%
No	52	17.5%	120	40.5%	60	20.3%	16	5.5%	248	83.8%
Total	**59**	**19.9%**	**149**	**50.3%**	**71**	**24.0%**	**17**	**5.8%**	296	100.0%

Freq.: Frequence, Perc.: Percent

Table 6. Correlations between green tobacco sickness and tobacco producers

	Education	Non-agricultural income (%)	Pesticide Application	Method of application	Snacking during harvest	Harvest after rainfall or dew	Height of tobacco leaves during harvest	Protective equipment usage	Tobacco leaf stringing	Sickness	Having heard of green tobacco sickness
Non-agricultural income (%)	**-.086**										
Pesticide application	-.011	-.018									
Method of application	.045	-.011	-.702**								
Snacking during harvest	-.071	.095	.134*	-.101							
Harvest after rainfall or dew	-.068	-.048	.046	-.099	.185**						
Height of tobacco leaves during harvest	-.053	.146*	-.044	-.069	.165**	.182**					
Protective equipment usage during harvest	.021	-.025	-.075	.104	-.211**	-.010	-.190**				
Tobacco leaf stringing	.112	.026	.013	-.080	.057	.062	.272**	-.062			
Post-harvest sickness	-.032	.094	-.071	.035	-.079	-.052	-.013	.010	.097		
Having heard of green tobacco sickness	.016	-.053	.000	.058	-.033	.009	-.167**	.068	-.122*	-.037	
Adverse effects of tobacco cultivation on health	-.147*	-.013	.076	-.115*	.018	.042	-.126*	.098	-.058	.070	.059

*0.05 >p, **0.01>p

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CONFLICTS OF INTEREST

"The authors declare no conflict of interest".