



Determination of damage Rate of Sunn pest (*Eurygaster* spp.) and Wheat Sting Bug (*Aelia* spp.) in Some Bread Wheat Varieties in Konya, Turkey

Sümeyye AYDOĞAN^{1*}, Levent ÜNLÜ¹

¹Selcuk University, Faculty of Agriculture, Department of Soil Science and Plant Nutrition, Konya, Turkey

ARTICLE INFO

Article history:

Received date: 06.09.2020

Accepted date: 20.10.2020

Edited by:

Murat KARACA; Selcuk University, Turkey

Keywords:

Sunn pest (*Eurygaster* spp.)

Wheat sting bug (*Aelia* spp.)

Bread Wheat

Protein

Hectoliter

ABSTRACT

This study was carried out in order to determine the damage rate of Sunn pest (*Eurygaster* spp.) and Wheat sting bug (*Aelia* spp.) in bread wheat varieties which brought to Konya Commodity Exchange and grown in 33 neighborhoods of Karatay which is the central district of Konya province of Turkey, during 2014-2018. Samples were taken homogeneously with an automatic probe device in according with the ISO 24333 Sampling Standard. Analysis samples were taken from these samples in according with TS 2974 Wheat Standard and were cleaned and sieved from foreign materials. The grains that have been damaged by Sunn pest (*Eurygaster* spp.) and Wheat sting bug (*Aelia* spp.) damage have been determined, selected and weighed, and the damage rate of the grains by mass was calculated. Protein and hectolitre values were also determined by measuring the remaining sample on the device working with the Near Infrared Transmission (NIT) principle. As a result of the research; in harvest seasons between 2014 and 2018, the average of Sunnpests damage in bread wheat coming from all districts of Karatay District were 1.1%, 0.8%, 0.9%, 0.9% and 1.1%, respectively. It was observed that the average of Sunn pest (*Eurygaster* spp.) and Wheat sting bug (*Aelia* spp.) damage rate ranged between 0.8-1.5%, protein averages ranged between 12.7-14.1% and hectoliter weights between 76.8-79.4 kg in 2014-2018 harvest seasons.

1. Introduction

Agriculture is a strategic sector that has maintained its importance throughout the history of humanity and has been increasing its importance day by day. People are involved in agriculture for centuries to meet their nutritional requirements. Cereals constitute one of the most basic foodstuffs that plays a role both in human nutrition and animal nutrition.

Wheat has a special place among the grains, as it has a unique feature unlike other available grains and is the main raw material used in the production of many bakery products, especially bread. Among the cereal crops, wheat ranks 1st in various countries of the world in terms of cultivation area and production and same pattern is present in Turkey as well. It is an important culture plant due to its easy cultivation, its suitability for conversion to a wide variety of foods and its role in nutrition (Anonymous, 2009).

According to the 2018/2019 production reports, Europe shared 19% of the total wheat production and gained 1st place in world, followed by China with 18% and India with 14%. Turkey shared 3% and ranked ninth in the world in wheat production (Anonymous, 2019).

Wheat can be grown in every region of Turkey, however it is widely produced in the Central Anatolia Region. In 2017, the Central Anatolia Region ranked first with 32% share for bread wheat production. This is followed by the Marmara Region with 18% and the Southeastern Anatolia Region with 15%. The regions with the lowest production are Eastern Anatolia and Aegean Regions (Anonymous, 2018).

Konya stand 1st with a total share of 10.7% in grain production in Turkey with 1.686.326 tons of wheat production in the years leading state at 2020 year in Turkey. Konya alone produce 9.7% of the wheat produced in Turkey. On the basis of higher agricultural potentials, especially Çumra, Altınekin, Karapınar, Karatay, Ereğli, Kulu and Cihanbeyli districts of Konya, stand out due to their irrigation facilities (Anonymous, 2020a).

* Corresponding author email: aydogansumeyye@hotmail.com

Variety of wheat, climate, soil characteristics, growing techniques and conditions, Sunn pest (*Eurygaster* spp.) and Wheat sting bug (*Aelia* spp.) damage, classification and registration of wheat, are the main factors affecting yield and quality in wheat. Sunn pest and Wheat sting bug, the leading pests of grains in Turkey that negatively affect yield and quality before harvest (Anonymous, 2005; Duman et al., 2008; Mutlu et al., 2014; Mutlu et al., 2016; Kılıç et al., 2018; Mutlu and Karaca, 2019). Since it is impossible to distinguish between the wheat varieties damaged by Sunn pest and Wheat sting bug, the damage of the Sunn pest and Wheat sting bug is evaluated together (Lodos, 1986). The reason, grain damaged of Sunn pest and Wheat sting bug impairs the bread quality of wheat is the proteolytic and amylolytic enzymes that these Sunn pest and Wheat sting bug leave in the grain while feeding from the wheat. These enzymes pass into flour during wheat processing and break down proteins during dough formation (Lorenz & Meredith, 1988; Karababa & Ozan, 1988; Türker, 2002).

Bilici (2013) reported that the rate of Sunn pest (*Eurygaster* spp.) and Wheat sting bug (*Aelia* spp.) damage was below 1.5% in the wheat varieties most traded in Konya Commodity Exchange in 2011-2013 harvest seasons. Hüdaverdi and Muştu (2018) reported that the average damage rate of Sunn pest and Wheat sting bug were 0.80% in the wheat cultivars grown in Edirne Province in 2017. Özbek and Fidan (2013) reported that among the disease / pest factors affecting the price most for wheat coming to the Konya Commodity Exchange during the harvest season of 2010 was the Sunn pest and Wheat sting bug damage.

Quality and classification of bread wheat are made to evaluate the physical analysis results according to the quality criteria specified in the wheat Purchase Scale published by the Turkish Grain Board. Bread wheat divided into several groups according to the color, hardness and quality of wheat in the TMO Scale. Minimum prices are determined in Turkish lira (TL) per tonne according to these groups and these minimum prices which are determined every year, are published in the scales by the TMO. The price of a bread wheat is according to the determined group and quality criteria determined according to the physical analysis result. Sunn pest (*Eurygaster* spp.) and Wheat sting bug (*Aelia* spp.) infesting rate, protein value and hectolitre weight have a very important place in terms of affecting the price within these quality criteria. Price formation in sales transactions is also made according to these determined quality criterias.

The reason for choosing Karatay District (Konya) to determine to wheat damage rates of the Sunn pest (*Eurygaster* spp.) and Wheat sting bug (*Aelia* spp.) in this study was that it has a high agricultural potential and it has the highest transaction volume in Konya Commodity Exchange.

2. Materials and Methods

In the study, bread wheats were brought to Konya Commodity Exchange from the neighborhoods of Karatay District of Konya province were sampled during in the harvest seasons of 2014-2018. subregions were created from 33 neighborhoods (three groups with 5 neighborhood and three other groups with 6 neighborhoods were assembled) according to their proximity to the center and to each other and information about the groups is given in Table 1. Neighborhoods are listed alphabetically among their groups and the locations map of the neighborhoods that make up the sub regions are given in Figure 1.

Physical analysis of wheat samples was carried out in according with TS 2974 Wheat Standard in order to determine the Sunn pest (*Eurygaster* spp.) and Wheat sting bug (*Aelia* spp.) damage ratio and protein and hectolitre weight.

3-kg samples were taken homogeneously from the bread wheat with an automatic probe device in according with ISO 24333 Sampling Standard. Then 1 kg sub-sample was taken homogeneously from the sample of 3 kg with conical sample divider. This 1 kg sample was sieved with the relevant sieves and cleaned from foreign materials and 50 g of wheat samples required for homogeneous analysis were separated. This 50 g of analysis sample was first spread on a flat surface and all the Sunn pest (*Eurygaster* spp.) and Wheat sting bug (*Aelia* spp.) damaged grains were selected by naked eye and separated with the help of analysis forceps, weighed on a sensitive scale and the result was multiplied by 2 and the ratio of damaged grain to mass was determined as percentage. In order to determine the protein and hectolitre weights of the remaining sample, the sample was poured into the receptacle of the measuring device working on the principle of Near Infrared Transmission (NIT), and protein and hectolitre weights were measured. The data obtained as a result of all physical analyzes were recorded and evaluations were made according to these data.

3. Results and Discussion

This study was carried out in Konya Commodity Exchange, in Karatay District (Konya), which has the highest transaction volume covering 2014-2018 harvest seasons, aiming to determine the rate of Sunn pest (*Eurygaster* spp.) and Wheat sting bug (*Aelia* spp.) damage in the bread wheats brought and how this damage affects the protein and hectolitre value of wheat. The results of physical analysis was performed in bread wheat during the 2014-2018 harvest seasons are shown in Tables 2, 3, 4, 5 and 6, respectively.

Table 1

Karatay District Neighborhoods Sub Regions

Neighborhood Name	Sub Regions					
	I	II	III	IV	V	VI
Bakırtolu	Acıdort	Göçü	Akbaş	Akörenkişla	Başgötüren	
Erler	Çengilti	Hayroğlu	İpekler	Aksaklı	Köseali	
Sakyatan	Divanlar	İsmil	Karadona	Beşagıl	Obruk	
Saraçoğlu	Karakaya	Ovakavağı	Katranacı	Büyükburnak	Sürtüç	
Şatır	Ortakonak	Yarma	Kızören	Yağlıbayat	Yavşankuyu	
Tatlıcak	Zincirli			Yenikent		

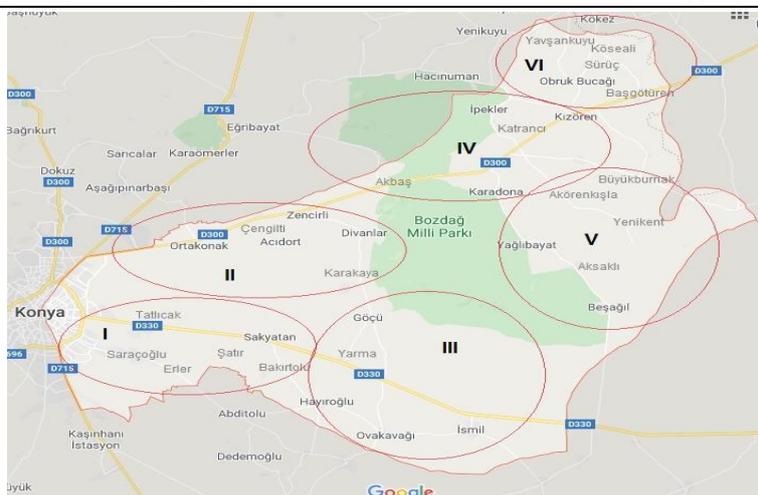


Figure 1.

Karatay District Map Neighborhood Sub Regions (Anonymous, 2020b)

Table 2

Physical analysis results of Wheat samples in Karatay District in 2014 harvest season

Year	Neighborhood Sub Regions	Total Amount (Ton)	Incoming Product (Number)	Sunn pest and Wheat sting bug Loss Rate Average (%)	Protein Value Average (%)	Hectoliter Weight Average (kg)
2014	I. Sub Regions	12.930.163	701	1.11	12.1	80.1
	II. Sub Regions	10.750.497	691	1.34	12.9	79.5
	III. Sub Regions	18.935.107	1.067	1.15	12.4	80.2
	IV. Sub Regions	6.773.730	412	1.04	13.5	78.7
	V. Sub Regions	18.061.815	1.142	0.98	13.5	78.6
	VI. Sub Regions	11.544.482	644	0.93	13.2	78.1
Average				1.09	12.9	79.2

In the year 2014, a sum of 4.657 produces from six sub regions came to the Konya Commodity Exchange. The total amount of incoming products was 78.995.794 tons. The average of Sunn pest (*Eurygaster*spp.) and Wheat sting bug (*Aelia* spp.) damage ratio on wheat was the highest with 1.34% in the II. subregion and the lowest with 0.93% in the VI. Sub Region. The average protein value was the highest with 13.5% in the IV and

V. sub regions, the lowest was with 12.1% in the I. sub region. The highest average of hectoliter weight was with 80.2 kg in the III. subregion, the lowest was with 78.1 kg in the VI. subregion. For whole of the six subregions in this year, the average of Sunn pest and Wheat sting bug damage ratio was 1.09%, the average protein value was 12.9% and the average hectoliter weight was 79.2 kg.

Table 3

Physical analysis results of Wheat samples in Karatay District in 2015 harvest season

Year	Neighborhood Sub Regions	Total Amount (Ton)	Incoming Product (Number)	Sunn pest and Wheat sting bug Loss Rate Average (%)	Protein Value Average (%)	Hectoliter Weight Average (kg)
2015	I. Sub Regions	15.592.122	792	0.82	11.6	79.3
	II. Sub Regions	19.296.331	1.051	0.84	11.3	79.8
	III. Sub Regions	24.462.756	1.236	0.84	12.0	79.7
	IV. Sub Regions	12.422.154	594	0.79	11.7	79.8
	V. Sub Regions	37.301.919	1.839	0.75	12.0	79.6
	VI. Sub Regions	18.390.843	863	0.72	12.2	78.0
Average				0.79	11.8	79.4

In the year 2015, a sum of 6.375 produces from six sub regions came to the Konya Commodity Exchange. The total amount of incoming products is 127.466.125 tons. The average of Sunn pest (*Eurygaster*spp.) and Wheat sting bug (*Aelia* spp.) damage ratio on wheat was the highest with 0.84% in the II and III. subregions and the lowest with 0.72% in the VI. subregion. The average protein value was the highest with 12.2% in the

VI. subregion, while the lowest was with 11.3% in the II. subregion. The highest average hectoliter weight was with 79.8 kg in the II and IV. subregions, the lowest was with 78.0 kg in the VI. subregion. For whole of the six subregions total for this year, the average Sunn pest and Wheat sting bug damage ratio was 0.79%, the average protein value was 11.8% and the average hectoliter weight was 79.4 kg.

Table 4

Physical analysis results of Wheat samples in Karatay District in 2016 harvest season

Year	Neighborhood SubRegions	Total Amount (Ton)	Incoming Product (Number)	Sunn pest and Wheat sting bug Loss Rate Average (%)	Protein Value Average (%)	Hectoliter Weight Average (kg)
2016	I. Sub Regions	10.926.218	608	0.94	14.0	77.4
	II. SubRegions	9.171.325	565	1.06	13.3	77.9
	III. Sub Regions	17.694.220	920	0.87	13.5	78.3
	IV. Sub Regions	5.418.625	315	0.81	15.0	76.5
	V. Sub Regions	21.346.653	1.123	0.78	14.2	77.9
	VI. Sub Regions	10.250.830	520	0.71	14.4	76.6
	Average			0.86	14.1	77.4

In the year 2016, a sum of 4.051 produces from six subregions came to the Konya Commodity Exchange. The total amount of incoming products was 74.807.871 tons. The average of Sunn pest (*Eurygaster*spp.) and Wheat sting bug (*Aelia* spp.) damage ratio on wheat was the highest with 1.06% in the II. subregion and the lowest with 0.71% in the VI. subregion. The average protein value was the highest

with 15.0% in the IV. subregion, while the lowest was with 13.3% in the II. subregion. The highest average hectoliter weight was with 78.3 kg in the III. subregion, the lowest was with 76.5 kg in the IV. subregion. For whole of the six subregions total for this year, the average Sunn pest and Wheat sting bug damage ratio was 0.86%, the average protein value was 14.1% and the average hectoliter weight was 77.4 kg.

Table 5

Physical analysis results of Wheat samples in Karatay District in 2017 harvest season

Year	Neighborhood Sub Regions	Total Amount (Ton)	Incoming Product (Number)	Sunn pest and Wheat sting bug Loss Rate Average (%)	Protein Value Average (%)	Hectoliter Weight Average (kg.)
2017	I. Sub Regions	11.658.961	561	0.96	13.1	78.2
	II. Sub Regions	11.548.958	618	1.03	12.6	78.7
	III. Sub Regions	19.159.700	920	0.86	13.5	78.0
	IV. Sub Regions	8.323.648	418	0.74	12.6	78.7
	V. Sub Regions	21.912.554	1.094	0.74	13.1	78.7
	VI. Sub Regions	11.248.507	507	0.73	13.0	77.6
	Average			0.84	13.0	78.3

In the year 2017, a sum of 4.118 produces from six sub regions came to the Konya Commodity Exchange. The total amount of incoming products was 83.852.328 tons. The average of Sunn pest (*Eurygaster*spp.) and Wheat sting bug (*Aelia* spp.) damage ratio on wheat was the highest with 1.03% in the II. subregion and the lowest with 0.73% in the VI. subregion. The average protein value was the highest with 13.5% in the III.

subregion, while the lowest was with 12.6% in the II. and VI. subregions. The highest average hectoliter weight was with 78.7 kg in the II. IV. V. sub regions, the lowest was with 77.6 kg in the VI. sub region. For whole of the six subregions total for this year, the average Sunn pest and Wheat sting bug damage ratio was 0.84%, the average protein value was 13.0% and the average hectoliter weight was 78.3 kg.

Table 6

Physical analysis results of Wheat samples in Karatay District in 2018 harvest season

Year	Neighborhood Sub Regions	Total Amount (Ton)	Incoming Product (Number)	Sunn pest and Wheat sting bug Loss Rate Average (%)	Protein Value Average (%)	Hectoliter Weight Average (kg)
2018	I. Sub Regions	6.835.908	328	1.10	12.6	76.3
	II. Sub Regions	8.940.480	460	1.49	12.5	77.0
	III. Sub Regions	17.062.935	795	1.10	12.8	77.5
	IV. Sub Regions	7.654.070	350	1.03	12.9	77.0
	V. Sub Regions	24.868.084	1160	0.94	12.6	77.1
	VI. Sub Regions	13.070.851	551	0.90	12.9	76.1
	Average			1.09	12.7	76.8

In the year 2018, a sum of 3.644 produces from six subregions came to the Konya Commodity Exchange. The total amount of incoming products was 78.432.328 tons. The average of Sunn pest (*Eurygaster*spp.) and Wheat sting bug (*Aelia* spp.) damage ratio on wheat was the highest with 1.49% in the II. subregion and the lowest with 0.90% in the VI. subregion. The average protein value was the highest with 12.9% in the IV and VI. subregions, while the lowest was with 12.5% in the II. subregion. The highest average hectoliter weight was with 77.5 kg in the III. subregion, the lowest was with 76.1 kg in the VI. subregion. For whole of the six subregions total for this year, the average Sunn pest and Wheat sting bug damage ratio was 1.09%, the average protein value was 12.7% and the average hectoliter weight was 76.8 kg.

In a study conducted by Bilici (2013), during the harvest seasons of 2011-2013 in the five districts of Konya province, Sunn pest (*Eurygaster*spp.) and Wheat sting bug (*Aelia* spp.) damaged grain ratio, protein and hectolitre weights had been determined and reported. The average Sunn pest and Wheat sting bug damage on wheat from all districts were 1.12% in 2011, 1.35% in 2012 and 1.13% in 2013. In the 2011-2013 harvest seasons. Bilici (2013) also reported the pest damage intensity was higher in 2012 compared to other years, and in the all wheat varieties selected from all districts average of Sunn pest and Wheat sting bug damage was below 1.50%, protein averages were 11.0% and hectoliter weights above 79.0%. As a result of analyzes carried out in bread wheat varieties in Karatay district, the sucked(damaged?) grain ratio of Sunn pest and Wheat sting bug reported to vary between 0.93% and 2.09%.

In the study of Özbek and Fidan (2013), according to the results of the data obtained from Konya Commodity Exchange reported that among the disease / pest factorsthe Sunn pest (*Eurygaster*spp.) and Wheat sting bug (*Aelia* spp.) damage was the most affecting factors determining the price in wheat varieties harvested in 2010. The results of the analysis indicated that 98.50% of 666 wheat samples analyzed were found to be damaged by Sunn pest and Wheat sting bug and as a result 61.26% of the samples had price reduction compared to the Wheat Grain Office (TMO)

wheat purchase scale. They reported that the average rate of destruction in wheat samples with Sunn pest and Wheat sting bug damage was 1.43%, and this rate was low as the price reduction rate compared to the TMO wheat purchase scale and had an effect of a 0.5% decrease in the price.

Hüdaverdi and Muştu (2018), reported that there were 42 wheat varieties grown in 38 villages in the central district of Edirne Province and 78 wheat varieties cultivated by the Thrace Agricultural Research Institute in Edirneandthe average of Sunn pest (*Eurygaster*spp.) and Wheat sting bug (*Aelia* spp.) damage in wheat varieties coming from Edirne Commodity Exchange from the villages of the central district of the city determined as 0.80% in the harvest season of 2017. They also reported that the highest average damage ratio was in the village of Budakdoğanca with 1.25% and the ratio of damaged grain in bread wheat varieties taken from Trakya Agricultural Research Institute trials ranged between 0.20-3.04%.

In the current study, Sunn pest (*Eurygaster*spp.) and Wheat sting bug (*Aelia* spp.) damage determined to be 1.09%, 0.79%, 0.86%, 0.84% and 1.09%,fortheharvestseasons of 2014 to 2018, respectively. Compared to theother years, the lowest loss rate was in 2015 and the highest loss rate was in 2014 and 2018. Looking at thecumulativedata, the average of Sunn pest and Wheat sting bug damage ratio of all neighborhoods were below 1.00%, protein averages were 12.5% and hectoliter weight averages were 78.0.

In a study conducted by Bilici (2013), as a re-sult of the physical analysis of bread wheats from Karatay District, the rate of Sunn pest (*Eurygaster*spp.) and Wheat sting bug (*Aelia* spp.) damage was determined as 0.93-2.09% in the 2011-2013 harvest seasons. In this study in the 2014-2018 seasons, the rate of Sunn pest and Wheat sting bug damage was observed as 0.71-1.49%. When as a result the two studies were compared that had been determined there was a decrease the rate of Sunn pest and Wheat sting bug in the harvest seasons 2014-2018 according to 2011-2013. In the study conducted by Bilici (2013), in wheats grown in Konya in 2010 and coming to Konya

Commodity Exchange, the average Sunn pest and Wheat sting bug damage rate was 1.43%, in the wheats coming from Karatay District in the 2011-2013 harvest period the average of the damage rate was below 1.50%. In this study the average Sunn pest and Wheat sting bug damage rate was determined to be below 1.00% during the 2014-2018 harvest seasons.

Hüdaverdi and Muştu (2018), in Edirne, it was determined that the average of Sunn pest (*Eurygaster*spp.) and Wheat sting bug (*Aelia* spp.) damage ratio was 0.80% in 2017. Compared this two study, the loss rate of sunn pests in Edirne is lower than the average of sunn pests determined in Karatay (Konya) district in 2014-2018 harvest seasons. While the highest Sunn pest and Wheat sting bug damage ratio was 1.25% in Edirne, the highest damage rate was determined as 1.49% during the five harvest seasons in

Karatay District. The degree and shape of the Sunn pest and Wheat sting bug damage can vary depending on the biological periods (nymph and adult) and density of the pest, the variety and phenological period of the grain, climatic conditions (especially temperature and precipitation) (Özkan&Barbaroğlu, 2015). It is thought that the low damage rate in Edirne Province was resulted in by climate conditions, selection of resistant varieties, and better irrigation facilities. In Konya Province, it is thought that low rainfall and high temperatures caused by climate conditions caused high damage rates.

Table 7 showed how the Sunn pest and Wheat sting bug loss affects the price of wheat during the harvest seasons between 2014-2018 only in Karatay (Konya) District..

Table 7

The effect of Sunn pest and Wheat sting bug damage on price in 2014-2018 harvest seasons only in Karatay(Konya) District

Year	Total Amount (Tons)	Sunn pest and Wheat sting bug Loss Rate Average (%)	Unit Price Discount Rate (TL/Ton)	Total Price Discount Rate (TL/Ton)
2014	78.995.794	1.09	- 1.0 TL	- 861.054 TL
2015	127.466.125	0.79	-	-
2016	74.807.871	0.86	-	-
2017	83.852.328	0.84	-	-
2018	78.432.328	1.09	- 1.0 TL	- 857.626 TL

According to the 2018 Wheat Purchase Scale, if Sunn pest (*Eurygaster*spp.) and Wheat sting bug (*Aelia* spp.) damage ratio is between 3.01-3.50%, the price was cut up to 8.0 TL per tonne, the most important criterion effecting discounted price. This damage rate is a reason for a serious price decrease and economic loss. For this reason, over the years, great importance has been given to the fight against Sunn pest and Wheat sting bug and quality and product losses have been tried to be minimized. During the five harvest seasons, the average of Sunn pest and Wheat sting bug damage was determined as 0.94% in all neighborhoods of Karatay District. It has been determined that this value, according to the scale, can be considered to be below the limit of low quality or that the wheat cannot be purchased (3.50%), and it does not cause a price reduction.

In the harvest seasons between 2014 and 2018; the average protein value of bread wheat from all neighborhoods was determined to be 12.9%, and this value was found to be above the limit to be discounted. The average protein value had been the highest at 14.1% in 2016, the lowest at 11.8% in 2015. The average weights of hectoliter were determined as 78.2 kg and it was determined that discount of price was above the limit to be applied. Hectoliter weight average had been determined the highest was 79.4 kg in 2015 and the lowest was 76.8 kg in 2018.

In the current study, Sunn pest (*Eurygaster*spp.) and Wheat sting bug (*Aelia* spp.) damage was observed in bread wheat from all neighborhoods in the harvest seasons between 2014 and 2018; and the average damage rate was 0.94%. When the neighborhoods of Karatay District are compared; the minimum rate of damage during the five harvest seasons was found to be in the Sub Region VI and ranged from 0.71% to 0.93%. During the five harvesting seasons, the highest rate of Sunn pest and Wheat sting bug damage rate was in sub region II. and varies between 0.84% and 1.49%. In these regions, besides the Sunn pest and Wheat sting bug damage; wheat variety cultivated, soil structure, irrigation and cultivation techniques are other factors that affect quality of the production.

In Karatay District, the fact that the rate of Sunn pest (*Eurygaster*spp.) and Wheat sting bug (*Aelia* spp.) damage was found to be below the economic tolerance level shows that it is a district with high quality production. For many years, Sunn pest and Wheat sting bug are known to cause to significant yield and quality losses almost all wheat producing areas in Turkey As a result of the transfer of the information obtained through research in different regions of Turkey, seems to have helped in the control of Sunn pest and Wheat sting bug. Mostly, it is aimed to protect the natural balance and increase the number of the natural enemies of the Sunn pest and Wheat sting bug and to reduce the

losses caused by the pests in the areas where these pests are fought.

As a result, efficiency and quality increase in recent years, with biological control and beneficial insect release, state policies and training studies for farmers have been determined to reduce the Sunn pest (*Eurygaster* spp.) and Wheat sting bug (*Aelia* spp.) damage to a great extent. Biological control is given more importance than chemical control. Nowadays, it is seen that Turkish farmers are also conscious of higher quality production and thus higher quality production is made.

4. Acknowledgements

In this research, to the Konya Commodity Exchange institution to thank for their support. Authors are grateful to TairEsenali UULU (PhD student, Department of Plant Protection, Faculty of Agriculture, Selcuk University) for translation help of manuscript.

5. References

- Anonymous (2005). T.C. Tarım ve Köy işleri Bakanlığı Koruma ve Kontrol Genel Müdürlüğü, Hububatta Görülen Önemli Hastalık ve Zararlılar, Ankara, 1-25.
- Anonymous (2009). Food and Agriculture Organization of the United Nations, Statistical Database, <http://www.fao.org>
- Anonymous (2018). TMMOB Ziraat Mühendisleri Odası, [online], Ankara, http://www.zmo.org.tr/genel/bizden_detay.php?kod=30125&tipi=17&sube=0. [Ziyaret Tarihi: 20 Şubat 2020]
- Anonymous (2019). Toprak Mahsülleri Ofisi, Hububat Sektör Raporu 2018, TMO, Ankara, 1-10
- Anonymous (2020a). Konya Ticaret Odası, [online], Konya, <http://www.kto.org.tr/tarim-449s.htm>. [Ziyaret Tarihi: 21 Şubat 2020]
- Anonymous (2020b). Google Haritalar, [online], <https://www.google.com/maps/place/Karatay>. [Ziyaret Tarihi: 21 Şubat 2020]
- Bilici E (2013). Konya İlinde Yaygın Yetiştirilen Buğday (*Triticum* spp.) Çeşitlerinde Süne (*Eurygaster* spp.) ve Kımıl (*Aelia* spp.) Emgili Dane Zararı ile Protein ve Hektolitre Ağırlıklarının Tespiti, (Yayımlanmamış Yüksek Lisans Tezi), Selçuk Üniversitesi, Fen Bilimleri Enstitüsü, Bitki Koruma Anabilim Dalı, Konya.
- Duman M, Gözüaçık C, Karaca V, Mutlu Ç (2008). Süne Mücadelesinde Çiftçi Davranışları: Adıyaman-Diyarbakır-Mardin-Şanlıurfa Örneği. Harran Üniversitesi Ziraat Fakültesi Dergisi, 12(4), 65-71.
- Hüdaverdi RE, Muştı M (2018). Edirne İli Merkez İlçesine Bağlı Köylerde Yetiştirilen Farklı Buğday Çeşitlerinde Görülen Süne (*Eurygaster* Spp.) Ve Kımıl (*Aelia* Spp.) Zarar Oranları, III. Uluslararası Multidisipliner Çalışmaları Kongresi, 5-6 Ekim 2018, Kiev-Ukrayna, Birinci Basım Aralık 2018.
- Karababa E, Ozan AN (1988). Effect of Wheat Bug (*Eurygaster integriceps*) Damage on Quality of a Wheat Variety Grown in Turkey, J. Sci. Food Agriculture 77, 399-403.
- Kılıç H, Aktaş H, Kendal E, Altıkat A, Karahan T, Karaca V, Mutlu Ç, Duman M (2018). Farklı Fenolojik Özelliklere Sahip Durum Buğday Genotiplerinin Süne (*Eurygaster integriceps* Put.) Zararına Mukavemet Bakımından Değerlendirilmesi. Dicle Üniversitesi Fen Bilimleri Enstitüsü Dergisi, 7(1), 1-12.
- Lodos, N., 1986, Türkiye Entomolojisi (genel, uygulamalı ve faunistik), Ege Üniversitesi Ziraat Fakültesi Yayınları, İzmir
- Lorenz K, Meredith P (1988). Insect Damaged Wheat. Effects on Starch Characteristic, Starch/Stärke 40 (4), 136-139.
- Mutlu Ç, Canhilal C, Karaca V, Duman M, Gözüaçık C, Kan M (2014). Economic threshold revision of the Sunn pest (*Eurygaster integriceps* Put.) on wheat in Southeastern Anatolia Region. Türkiye Entomoloji Bülteni, 4(3): 157-169.
- Mutlu Ç, Duman M, Karaca V, Bayram Y, Sıray E, Kan M (2016). A case study of consciousness level of the farmers in control of overwintering adult Sunn pest: Southeast Anatolia Region. Turkish Journal of Agricultural and Natural Sciences 3(4): 280-287.
- Mutlu Ç, Karaca V (2019). Management Success Against Sunn Pest In Response to Transition from Aerial Spraying to Controlled Farmer Management: An Overview. 1ST International Gobeklitepe Agriculture Congress, November 25-27 November, Şanlıurfa, 1 (1), 518-522.
- Özbek FŞ, Fidan H (2010). Konya İlinde Buğday Üretiminde Ürün Kaybına ve/veya Fiyat İndirimine Neden Olan Hastalık ve Zararlıların İncelenmesi, Selçuk Tarım ve Gıda Bilim. Dergisi, 27(2):92-97
- Özkan M, Babaroğlu NE (2015). TC Gıda ve Tarım Bakanlığı Gıda ve Kontrol Genel Müdürlüğü, Süne Kitabı, Ankara.
- Türker S (2002). Buğday ve Un Kalitesinde Süne-Kımıl Zararının Etkileri Ve Alınacak Önlemler, Konya Ticaret Borsası Dergisi, 5 (12), 25-27.