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The effects of silver agcl2 ions at different doses on larval development of *Ephestia kuehniella* zell (lepidoptera: pyralidae)

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Abstract
The present study examined the effects of AgCl2 concentrations at different doses on larval development of *E. kuehniella*. AgCl2 solutions at concentrations of 0.4, 0.8, 1, 1.2 and 2 µM were applied against the 3rd and 5th larvae of *E. kuehniella*. As the dose increased, the mortality rate of *E. kuehniella* larvae also increased. Concentrations of 0.4µM had no effect on 3rd and larval stages of *E. kuehniella*. AgCl2 concentrations had much more effect on 3rd larval stages of *E. kuehniella* than on the larval stages, and the mortality rate was highest at concentrations of 2 µM. The sensitivities of the larval stages to the concentrations indicate that 3rd period of larvae were more affected by the concentrations than 5th period of larvae. When compared with the control group, it was statistically determined that those exposed to the doses of all 3 rd stage larvae and 5th stage larvae of 1 and 2 µM doses were adversely affected by heavy metals.

Keywords: *Ephestia kuehniella*, $AgCI_2$, Different Doze, Effect

Introduction

Even in low concentrations in water, poisonous substances can lead to deleterious diseases and even death. Ag is one of the elements comprising the most important group of these materials which can cause toxic effects even in trace amount. The majority of these elements are heavy metals [1]. Heavy metals are known to constitute an important group of contaminants. Not only do they have toxic and carcinogenic effects but also have a tendency to accumulate in living organisms [1]. In nature, metals such as chromium, mercury, lead, cadmium, manganese, cobalt, nickel, copper and zinc are usually found in the form of sulfur, oxide, carbonate, and silicate minerals [2]. Chloride (Cl^-) is the most common ion encountered in all natural and wastewaters. It is also known as the halogen which is found in the highest concentrations in nature [1].

Silver is used in the photographic industry, electronics, coining, ornament and jewelry production, alloy making and dentistry. It is also used in artificial rain fall, mirror glaze production, computer relay contacts, and battery construction [2]. Known as another common pest of stored wheat, mill moth [*Ephestia kuehniella* Zell. (Lep. Pyralidae)] mainly has a damaging effect on flour and occasionally causes problems in grain storage areas [2]. Larvae of this pest produce a web-like material which adheres and infests the flour. In addition, the web-like material produced by the larvae can clog various parts of a factory machine and interfere with normal operations [3]. In recent years, the eggs of this species have been used in the mass production of predators [4]. There are no studies on the effects of heavy metals on *E. kuehniella*. The present study was investigated the effects of different concentrations of $AgCl_2$ on *E. kuehniella*.

Materials and Methods

E. kuehniella larvae, culture flasks and $AgCl_2$ concentrations at different doses were used in the study. In the analyzes, SPSS statistical analysis method was applied and the data were subjected to Wilcoxon Signed Rank test analyzes.

Rearing of *Ephestia kuehniella*

E. kuehniella was reared on a mixture of two-thirds wheat flour and one-third wheat bran at 25

°C, 60% relative humidity and in darkness (Fig. 1). The mixture was placed in plastic tubs (27x37x7 cm), *E. kuehniella* eggs were sprinkled onto the mixture and the top of the tubs was covered with cheesecloth. Newly hatched larvae fed on the mixture and were then ready for the trials.

Fig 1: Mass Rearing of *Ephestia kuehniella* Zell.

Application of Different Silver Concentrations

$AgCl_2$ solutions prepared at different concentrations were sprayed onto each test group three times. The trials were applied against 3rd and 5th larvae of *E. kuehniella*. In the trial, $AgCl_2$ solutions at concentrations of 0.4, 0.8, 1, 1.2 and 2 µM were applied. Each concentration was applied on 20 larvae. 3rd larvae period applications, including the application against 3rd and 5th larvae periods and the application against the control group, are 120 in total while the trials on 5th larvae period are 120 in total which means that 240 larvae were subjected to the application. Concentrations of different doses were sprayed onto the larvae which were then placed in the culture flasks and monitored daily until mature (Fig. 2). The period from larvae to mature was determined. Individuals who died or pupated were recorded daily. The trials were carried out at 25 °C, 60% relative humidity and in darkness.

Fig 2: Culture Flasks containing flour-bran mixture and *Ephestia kuehniella* Zell.

Results and Dıscussion

Fig. 3 and 4 shows the results of the effects of the application of $AgCl_2$ concentrations at different doses on 3rd and 5th larval development of *E. kuehniella*.

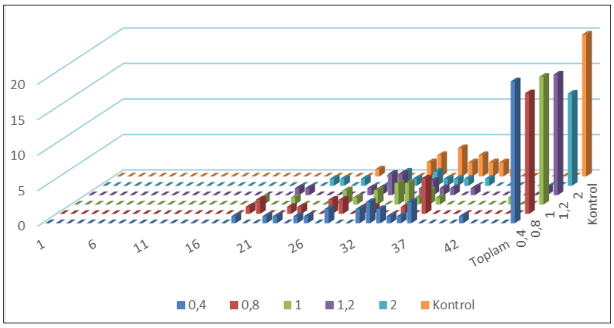

Fig 3: Effects of $AgCl_2$ concentrations at different doses on the 3rd period larvae of *E. kuehniella*.

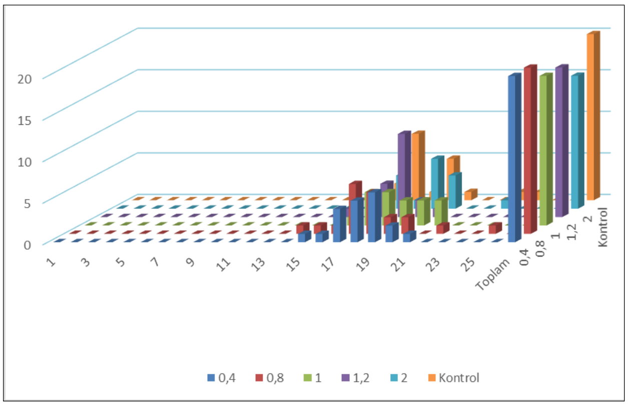

Fig 4: Effects of $AgCl_2$ concentrations at different doses on the 5th period larvae of *E. kuehniella*.

it was determined that all 3rd period larvae reached maturity on day 46 and all 5th period larvae reached maturity on day 26. As the concentration increased, the mortality rate of the larvae of *E. kuehniella* also increased. The sensitivities of the larval stages to the concentrations indicate that 3rd period of larvae were more affected by the concentrations than 5th period of larvae. Concentrations of 0.4 µM had no effect on 3rd and 5th larval stages of *E. kuehniella*. The mortality rate was highest in both larval stages at concentrations of 2 µM. But statistically; according to control application, all of 3. Stage larvae which exposed to heavy metal were different from the control. For 5. Stage larvae; only 1 ve 2 µM were different to control applications (Table 1 and 2). P <0.05, there is a significant difference compared to the control group of the groups.

Table 1: Test Statistics of Different Doses in the 3. Stage larvae of E. kuehniella.

	d0,4 - kontrol	**d0,8 - kontrol**	**d1.0 - kontrol**	**d1,2 - kontrol**	**d20 - kontrol**
Z	-3,776^b	-3,302^b	-3,082^b	-2,652^b	-2,155^b
Asymp. Sig. (2-tailed)	,000	,001	,002	,008	,031

a. Wilcoxon Signed Ranks Test

b. Based on positive ranks.

Table 2: Test Statistics of Different Doses in the 5. Stage larvae of *E. kuehniella*.

Test Statistics					
	d04 - kontrol	**d08 - kontrol**	**d10 - kontrol**	**d12 - kontrol**	**d20 - kontrol**
Z	-,687b	-,333c	-3,704b	-1,508b	-3,493b
Asymp. Sig. (2-tailed)	,492	,739	,000	,132	,000

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.

The earliest studies have been reported to determine the effects of environmental dusts on E. *kuehniella, Tribolium castaneum* and *Plodia interpunctella*, and it has been reported that environmental dusts are negatively affected, especially on the development of *E. kuehniella* individuals [5]. The results of this study are also important in the future to give an idea of how AgCl deposits may affect accumulation pests in storage, especially in storage. This is the first study to determine the effect of AgCl on pests.

Conclusion

There is no detailed study of the effects of AGCl on environmental and especially on the insects yet. However, it is crucial to conduct further research to determine the harmful effects of environmental contamination on living organisms. This study is a prototype one on *Ephistia kuehniella*, an important pest, and will set an example for studies of the effects of this compound on the other pests. The use of the eggs of these harmful organisms is important for mass production of some important predators at the same time for biological fighting and environmental ecosystem management. Because it is a factor in increasing the likelihood of environmental contamination in domestic environments.

References

1. Anonymous. MTA web page. Date: 02.01.2017.
2. Anonymous, 2016b. DSİ page. http://duzce.ormansu.gov.tr/.http://www.mta.gov.tr/v2.0/ default.php. Date: 02.01.2017.
3. Erdoğan P, ve Gürkan O. Investigation of Development and Competition between *Ephestia kuehniella* Zell. (Lepidoptera: Pyralidae) and *Rhyzopertha dominica* (F.) (Coleoptera: Bostrychidae) Laboratory Conditions Bit. Kor. Bült. 1995; 35(1-2):11-34.
4. Yanık E. Farklı Sıcaklıkların *Ephestia kuehniella* Zell. (Lep: Pyralidae) yumurtalarında beslenen Oenopia conglobata (L.) (Coleoptera: Coccinellidae)’ nin Biyolojik Özelliklerine Etkileri. HR.Ü.Z.F. Dergisi, 2011; 15(1):21-28.
5. Locatelli DP, Savoldelli S, Girhenti P, Limonta L. Can environmental dust from silo area allow the development of stored product insects? Journal of Stored Product Research. 2017; 71:41-46.