Research Article

DETERMINATION OF CONDITIONS RELATED TO AGES OF FIELD SPRAYERS USED IN SUNNPEST SPRAYING IN ŞANLIURFA

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ABSTRACT

This study was performed in the villages located within the towns of Siverek, Viranşehir and Hilvan in Şanlıurfa province where pesticides are sprayed against sunnpest (*Eurygaster spp.: Heteroptera-Scutelleridae*). The use of aircraft in pesticide application for sunnpest is important due to large areas, very short time period and topographycal conditions. On the other hand, in Turkey, in 2006, pesticide applications via agricultural aircraft were banned to cause of negative impacts on environmental and human health. The use of manual equipments and field sprayers against sunnpest was therefore decided in Turkey for pesticide applications. In this study, survey was made for field sprayer components condition that is used in the spraying for sunnpest. Also, material conditions of field sprayers were determined related to years. Survey study was conducted in the sixty farms in order to determining equipment and material of sprayers, and the process of determining how the actions of farmers. In this study, field sprayer used sunnpest spraying were evaluated related to years in terms of the tank strainer, nozzle filters, hoses connections and strength, pressure regulator, manometer, pump leakage, nozzle and boom connection, and tank cracken.

Key Words: Survey, condition of field sprayers, ages of field sprayers

ŞANLIURFA İLİNDE SÜNE İLAÇLAMASINDA KULLANILAN TARLA PÜLVERİZATÖRLERİNİN YAŞININ PÜLVERİZATÖR VE UYGULAMA AÇISINDAN DEĞERLENDİRİLMESİ

ÖZET

Bu çalışma, süne zararlısının yoğun olduğu Şanlıurfa ilinin Viranşehir, Siverek ve Hilvan ilçelerine bağlı köylerde yapılmıştır. Buğday alanlarının büyük olması, arazinin topografik durumu ve süne zararlısının çok kısa sürede ürüne zarar yapmasından dolayı uçakla mücadele oldukça büyük önem kazanmıştır. Ancak, tarım uçağı ile ilaçlamada karşılaşılan sorunlar nedeniyle dünyada olduğu gibi ülkemizde de uçakla ilaçlama 2006 yılından itibaren yasaklanmış ve süne ilaçlamalarının çiftçiler tarafından yer aletleri ile yapılması kararı alınmıştır. Bu çalışma ile bölge için yeni olan yer aletleriyle süne mücadelesi anket çalışması ile incelenerek pülverizatörlerin üzerinde barındırdığı ekipman ve malzemelerin mevcut durumları pülverizatörlerin yaşlarına bağlı olarak tespit edilmiştir. Bunun için 60 işletmede anket çalışması yapılmıştır. Süne ilaçlamasında kullanılan pülverizatörler depo süzgeci, meme filtreleri, hortumların bağlantısı ve sağlamlığı, basınç regülatörü, manometre, pompa sızıntısı, meme ve püskürtme çubuğu bağlantısı, depo çatlağı açısından değerlendirilmiştir.

Anahtar Kelimeler: Anket, tarla pülverizatörlerin durumu, tarla pülverizatörlerin yaşları

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INTRODUCTION

Plant protection machinery used in agricultural production increases efficiency to farms and provide continuity of crop production. In addition, the use of plant protection machinery in agricultural production prepares social and economic development of the population engaged in agriculture.

If plant protection machines are not used suitable spraying conditions for agricultural production, and technical characteristics of components of sprayers, the input costs increase in farms.

Although many machines are used in pesticide applications in agriculture, field and garden sprayers are commomly used especially in large areas. These machines contains many important components such as the tank, strainer valve, filter, air tank, spray nozzles, and pump. When these machines are used for many years by farmers, these components of sprayers wear out and break down. Accordingly, maintenance and repairs of spraying machines should be done on time, and in appropriate service conditions. If components of sprayers are faulty, level of success of pesticide applications reduce, and therefore, pesticide applications negatively effect human health and environment.

In Tekirdağ province, Demir and Çelen (2006) made survey study in order to determine the status of field sprayer. They determined 28% of blockages in the spray nozzles, and only 11% of farmers checked continuous control of nozzles, and these farmers changed disorder spraying nozzles.

In a study conducted in Van province, although the most commonly used type of nozzle was cone jet spray nozzles, it was determined that none of the farmers in the province were not educated about pesticide application (Bolat et al., 2003). In addition, such as a rough surface and poor quality of sprayer tank and not resistant to pesticides hoses second quality materials was used frequently in sprayers. These components that does not hold high-quality equipments were sold very cheaply and were held (Freidrich, 1996; van der Meijden, 1998; Abhilash and Singh, 2009). However, essential components of sprayers were used often extremely poor condition in farms. Therefore, leakage occurs in sprayer and its components (Tobi et al, 2011; Tobi et al., 2011).

Since farmers do not have sufficient knowledge of the methods and the selection of sprayer, farmers use excessive amount of agricultural pesticide in pesticide applications. If sprayers were operated at high pressure, operators or farmers select often excessive application norm than enough. Farmers and operators believed that high pressure and application norm was the most important factor in pesticide applications (Sağlam, 1998; Sağlam and Sağlam, 2000; Abhilash and Singh, 2009).

The aim of this study, it was to determine conditions of components of field sprayers used to sunnpest spraying in Şanlıufra province determined related to years by survey study. For this reason, field sprayer were evaluated related to age of field sprayers in terms of the tank strainer, nozzle filters, hoses connections and strength, pressure regulator, pressure gauge, pump leakage, nozzle and boom connection, warehouse fracture in this study.

MATERIAL and METHOD

Material

Survey and survey Area

This research was conducted on wheat fields that is intensively pesticide applications against sunnpest in districts Hilvan, Siverek and Viransehir districts of Şanlıurfa province.

Survey study was made for determine of how farmers do spraying and sprayers conditions.

Method

The survey were made in Hilvan, Siverek and Viransehir districts of Sanliurfa Province with a total of 60 farmers. While 20 pieces survey study for these each three districts were done, the current situation was determined. Villages of Viranşehir, Siverek and Hilvan districts was identified list. 6 pieces villages from each district was determined stratified sampling method. Eşkin, Demirci, Çokran, Kumçeşme, Arısu and Aşağıtınaz villages from Viranşehir district, Karakeçi, Özenpınar, Çaylarbaşı, Çatok, Avurtepe and Alagün from Siverek district and Kepirhisar, Atamer, Çekören Doğrular, Özveren and Akçakebir from Hilvan district was determined by lot. Then it was done three survey in the first four each of these villages in these districts it was done four survey in others.

Within the scope of this survey, while ages of field sprayer was determined, field sprayer were grouped related to their ages. During the evaluation in terms of field sprayer, 1-4 ages, 5-8 ages and 8 and over ages groups of field sprayer was referred 1. age group, 2. age group and 3. age group, respectively.

Whether or not pumps gived enough fluid pressure, inlet and outlet connections of pumps was secure was determined and whether

there was oil in the pump was checked. In addition, whether pump oil ran away spraying liquid was determined in this study. Regulator and manometers were checked during the pump was operated at spraying condition.

Sprayer nozzle on the boom of sprayers was counted. While sprayer nozzle were removed, their size and plate type was determined and whether or not the filters in sprayer nozzle was checked. By measuring individual distance between the two nozzle sets of sprayer nozzle placed on spraying boom, whether distance between the two nozzle was installed at appropriate intervals were checked.

After left and right parallelism adjustment of sprayer from the side and middle branches of tractor was done, doing height measurements from the mid-point, right and left edges to the ground of field sprayer boom on a flat surface was checked parallelism.

If there was broken or cracked in spraying tank was determined. Condition of hose and hose connections of sprayer was determined.

Statistical evaluation of condition of parts or equipments of field sprayers related to age of sprayer

In this research, field sprayer used sunnpest spraying were evaluated related to age of field sprayers in terms of the tank strainer, nozzle filters, hoses connections and strength, pressure regulator, manometer, pump leakage, nozzle and boom connection, tank cracken or broken.

SPSS statistical program was used for evaluation of a survey in farms depending on the field of research. Frequency tables were constructed related to the data of study of survey in SPSS. Chi-square test was used for conditions evaluation components of field sprayer related to year.

RESEARCH FINDINGS and DISCUSSION

Conditions of cover filter related to age of field sprayers

Since correlation between age of sprayer x cover filter as shown in Table 1 was $p< 0.01$, it was found to be very significant. According to this, cover filter of some sprayers related to the use of field sprayers was not determined. It was shown in table 2 that there are cover filters of sprayer in 100, 96, and 33.3% respectively of the 1., 2. and 3 age groups of sprayers. Also, it was established that there is no cover filters of sprayer in 0, 4 and 66.7% respectively of the 1., 2. and 3. age groups of sprayers,. In overall total, in 95% of field sprayers there were cover filters of sprayer.

Condition of nozzle filters related to age of field sprayers

Since the correlation between age of the sprayer x nozzle filter as shown in Table 3 was $p< 0.01$, it was found to be very significant. According to this, missing or problematic nozzle filters related to the age of field sprayers were determined. It was shown in Table 4 that nozzle filters were in good condition in 87.5, 60 and 0% respectively of the 1., 2. and 3. age groups of sprayers. Also, it was established that nozzle filters respectively had problems in 12.5, 40 and 100% respectively of the 1., 2. and 3. age groups of sprayers. In overall total, it was determined that while nozzle filters have problems in 28% sprayers nozzle filters have sound in 71.7% of field sprayers.

Table 1. Chi-square test of relationship between age of sprayer x cover filter

Khi kare değeri	Degrees of freedom	p value
25.754	2	0.000

Table 2. Conditions of cover filter related to age of sprayers

Sprayer age group		Cover filter		Total
		Available	Unavailable	
1. age group	Number	32	0	32
	(%)	100.0%	0.0%	100.0%
2. age group	Number	24	1	25
	(%)	96.0%	4.0%	100.0%
3. age group	Number	1	2	3
	(%)	33.3%	66.7%	100.0%
Total	number	57	3	60
	(%)	95.0%	5.0%	100.0%

Table 3. Chi-square test of relationship between age of sprayer x nozzle filter

Chi-square value	Degrees of freedom	p value
13.215	2	0.001

Table 4. Condition of nozzle filters related to age of sprayers

Sprayer age group		Condition of nozzle filters		Total
		Available	Missing and problematic	
1. age group	number	28	4	32
	(%)	% 87.5	% 12.5	% 100.0
2. age group	number	15	10	25
	(%)	% 60.0	% 40.0	% 100.0
3. age group	number	0	3	3
	(%)	% 0.0	% 100.0	% 100.0
total	number	43	17	60
	(%)	% 71.7	% 28.3	% 100.0

Table 5. Chi-square test of relationship between age of sprayer x hoses and hoses connections

Chi-square value	Degrees of freedom	p value
15.286	6	0.018

Table 6. Condition of hoses and hoses connections age of sprayers

Sprayer age group		Condition of hoses and hose connections				Total
		Very Problematic	Problematic	Sound	Less problematic	
1. age group	Number	2	1	23	6	32
	(%)	6.3	3.1%	71.9%	18.8%	100.0%
2. age group	Number	1	0	14	10	25
	(%)	4.0 %	0.0%	56.0%	40.0%	100.0%
3. age group	Number	0	1	0	2	3
	(%)	0.0%	33.3%	0.0%	66.7%	100.0%
Total	Number	3	2	37	18	60
	(%)	5.0%	3.3%	61.7%	30.0%	100.0%

Condition of hoses and hoses connections age of field sprayers

As shown in Table 5, the relationship between the age of sprayer and strength of hoses were found statistically significant at $p< 0.05$ level. According to this statistically analysis, in hose and hose connection points of sprayers some problems were detected related to the age of sprayers. As shown in Table 6, in 1. age group field sprayer, the number of sprayer whose hoses and hose connections are problematic are 9, while in 2. age group sprayers, the number of sprayer whose hoses and hose connections are problematic was found to be 11.0. In 3. age group sprayers, it was determined that there are three sprayers whose hoses and hose connection are problematic. In first, second and third age groups field sprayers, the percentages of sprayers whose hoses and hose connections had less problem were 18.8, 40 and 66.7, respectively. In first, second and third age groups field sprayers, the percentages of sprayers whose hoses and hose connections had problematic were 3.1, 0 and 33.3, respectively. In first, second and third age groups field sprayers, the percentages of sprayers whose hoses and hose connections were much problem were 6.3, 4 and 0, respectively. In overall total, in 61.67% of sprayers hose and hose connections were sound.

Condition of pressure regulators related to age of field sprayers

As shown in Table 7, relationship between the age of sprayer and pressure regulator were found statically significant at $p<0.01$. According to this, it was determined that some pressure regulator were not operated relation to the age of sprayers. In 1, 2, and 3 age groups field sprayers, the percentages of

sprayers whose pressure regulators do not operate were 3.1, 4.0 and 66.7, respectively. In first, second and third age groups field sprayers, the percentages of sprayers whose pressure regulators do operate were 96.9, 96 and 33.3, respectively (Table 8). In overall total, in 93.3% of field sprayers pressure regulators were sound.

Condition of manometers related to age of field sprayers

As shown in Table 9, the relationship between the age of sprayer and manometer were not found statistically significant at $p > 0.05$ level. According to this, manometers of some sprayers were not operated related to the age of sprayers. As shown in Table 10, In first, second and third age groups field sprayers, the percentages of sprayers whose manometers do not operate were 18.8, 40 and 66.7, respectivelly. In first, second and third age groups field sprayers, the percentages of sprayers whose manometers do not operate were 81.3, 60 and 33.3, respectivelly. In overall total, in 70% of field sprayers it was determined that manometers do not operate.

Condition of sprayer pumps related to age of field sprayers;

As shown in Table 11, the relationship between the age of sprayer and leak of pump were found statistically significant at $p < 0.01$ level. According to this, in pump of sprayers some problems were detected relation to the age of sprayers. As shown in Table 12, in first, second and third age groups field sprayers, the percentages of sprayers whose pumps are less leak were 15.6, 16 and 66.7, respectivelly. In first, second and third age groups field sprayers, the percentages of sprayers whose pumps are much problem were 0, 0 and 33.3, respectivelly. In first, second and third age groups field sprayers, the percentages of sprayers whose pumps are not problem were 84.4, 84 and 0 respectivelly.

Table 7. Chi-square test of relationship between age of sprayer x pressure regulator

Chi-square value	Degrees of freedom	p value
18.288	2	0.000

Table 8. Condition of pressure regulators related to age of sprayers

Sprayer age group		Condition of pressure regulators		Total
		Operated	Not operated	
1. age group	Number	31	1	32
	(%)	96.9%	3.1%	100.0%
2. age group	Number	24	1	25
	(%)	96.0%	4.0%	100.0%
3. age group	Number	1	2	3
	(%)	33.3%	66.7%	100.0%
Total	number	56	4	60
	(%)	93.3%	6.7%	100.0%

Table 9. Chi-square test of relationship between age of sprayer x manometer

Chi-square value	Degrees of freedom	p value
5.040	2	0.080

Table 10. Condition of manometers related to age of sprayers

Sprayer age group		Condition of Manometers		Total
		Operated	Not operated	
1. age group	Number	26	6	32
	(%)	81.3%	18.8%	100.0%
2. age group	Number	15	10	25
	(%)	60.0%	40.0%	100.0%
3. age group	Number	1	2	3
	(%)	33.3%	66.7%	100.0%
Total	number	42	18	60
	(%)	70.00%	30.00%	100.00%

Table 11. Chi-square test of relationship between age of sprayer x pump leakage

Chi-square value	Degrees of freedom	p value
25.552	4	0.000

Table 12.Condition of sprayer pumps related to age of sprayers

Sprayer age group		Condition of pump leaking			Total
		Sound	Less problematic	Much problematic	
1. age group	Number	27	5	0	32
	(%)	% 84.4	% 15.6	% 0.0	% 100.0
2. age group	Number	21	4	0	25
	(%)	% 84.0	% 16.0	% 0.0	% 100.0
3. age group	Number	0	2	1	3
	(%)	% 0.0	% 66.7	% 33.3	% 100.0
Total	number	48	11	1	60
	(%)	% 80.0	% 18.3	% 1.7	% 100.0

Table 13. Chi-square test of relationship between age of sprayer x sprayer nozzles and boom connections

Chi-square value	Degrees of freedom	p value
3.046	6	0.803

Table 14. Condition of sprayer nozzles and boom connections related to age of sprayers

Sprayer age group		Condition of sprayer nozzles and boom connection points				Total
		Less problematic	Sound	Much problematic	Problematic	
1. age group	Number	16	15	1	0	32
	(%)	50.0%	46.9%	3.1%	0.0%	100.0%
2. age group	Number	10	14	0	1	25
	(%)	40.0%	56.0%	0.0%	4.0%	100.0%
3. age group	Number	1	2	0	0	3
	(%)	33.3%	66.7%	0.0%	0.0%	100.0%
Total	number	27	31	1	1	60
	(%)	45.0%	51.7%	1.7%	1.7%	100.0%

Condition of sprayer nozzles and boom connections related to age of field sprayers

As shown in Table 13, the relationship between the age of sprayer and nozzle and boom connections were not found statistically significant at $p > 0.05$ level. Although, in nozzle and boom connections of sprayers some problems were detected related to the age of sprayers. As shown in Table 14, in first, second and third age groups field sprayers, the percentages of sprayers whose nozzle and boom hose connections have less problem were 50, 40 and 33.3%, respectivelly. In first, second and third age groups field sprayers, the percentages of sprayers whose nozzle and boom connections are not problematic were 46.9, 56 and 66.7, respectivelly. In first, second and third age groups field sprayers, the percentages of sprayers whose nozzle and boom connections are problematic were 0, 4 and 0, respectivelly. In first, second and third age groups field sprayers, the percentages of sprayers whose nozzle and boom connections are problematic were 3.1, 0 and 0, respectivelly. In overall total, in 51.7% of field sprayers nozzle and boom connections were sound.

Condition of sprayer tanks related to age of field sprayers

As shown in Table 15, the relationship between the age of sprayer and tank fracture

were found statistically significant at $p < 0.01$ level. According to this, in tank of some sprayers fractures were detected related to the age of sprayers. As shown in Table 16, in first, second and third age groups field sprayers, the percentages of sprayers whose tanks have fracture were 3.1, 4.0 and 66.7%, respectively. In first, second and third age groups field sprayers, the percentages of sprayers whose tanks have not problematic were 96.9, 96 and 33.3, respectively.

Discussion

According to this research results, while sprayers increased their ages, materials or equipment located on the sprayer was determined further problem. Because, in farms, second level materials such as rough surfaces and poor quality tank and hoses that were not resistant to pesticides frequently was used in sprayer and these equipments that are not hold quality equipment were sold very cheaply and kept on the market (Freidrich, 1996; van der Meijden, 1998; Abhilash and Singh, 2009).

In addition, components of spraying equipment were often used under extremely poor conditions due to deficiency of maintenance in farms. As a result of the use of spraying equipment, hose and connection points have been leaking (Tobi et al., 2011; Tobi, 2012). Because of the sprayer used for agricultural pesticide application for many years, materials or equipment located on the sprayer worn out or disturbed.

Therefore, maintenance and repairs of spraying machines must be done on time and in appropriate service conditions.

Conclusions

Sprayers contain many key equipments such as on the spray tank, strainer valve, filters, air tank, spray nozzles and pump. While these machines have been used for many years in pesticide applications by farms, equipment or material of sprayers are break down. When equipments or materials located on sprayer is faulty, pesticide applications is reduced level of success. In this way these applications negatively affects human health, the environment and the natural balance.

When equipment or materials of field sprayers was examined related to age of sprayers, in terms of tank filter cap, nozzle filters, hose connections, pressure regulator, pump leaking and tank crack was found statistically significant. Accordingly, when age of field sprayers increased, it was determined that problems increased in equipments or materials located on sprayer.

Manometers and spraying nozzle and boom connections located on sprayer were found statistically insignificant related to age of sprayers.

Table 15. Chi-square test of relationship between age of sprayer x tank cracken

Chi-square value	Degrees of freedom	p value
18.288	2	0.000

Table 16. Condition of sprayer tanks related to age of sprayers

Sprayer age group		Condition of sprayer tank		Toplam
		Sound	Broken or cracked	
1. age group	Number	31	1	32
	(%)	96.9%	3.1%	100.0%
2. age group	Number	24	1	25
	(%)	96.0%	4.0%	100.0%
3. age group	Number	1	2	3
	(%)	33.3%	66.7%	100.0%
Total	number	56	4	60
	(%)	93.3%	6.7%	100.0%

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