

Full Length Research Paper

An assessment of producer's approach to agricultural pesticide usage in potato production: A case study in Erzurum, Turkey

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The aim of this study is to determine farmers' tendency towards pesticide usage, its relationship with environment and the quantity and value of pesticide usage in potato production in Pasinler district of Erzurum Province in Turkey. Erzurum, particularly Pasinler district, has an important place in potato production. 95 potato producing farms in 9 villages were selected to represent the farms in the district. The villages were selected by using intentional sampling, while the farms in the villages were selected through simple random sampling covering 2004 production season. Interviews were conducted with 3 pesticide sellers and cooperative workers, as well. It has been concluded that, 11.58% of the producers indicated that the pesticide residues could be totally eliminated with washing the product. 45.26% indicated that chemical drugs don't leave residues. 48.42% of the farmers indicated that they throw away the insecticide packages without any care after applying the chemical. 29.47% disposed the packages by burning. 16.84% disposed them by burying them in the ground while 5.27% used garbage can for disposing the packages.

Key words: Pasinler district, Erzurum province, potato, agricultural pesticide.

INTRODUCTION

Potato has an important place in human nutrition following cereals. It is cheap, easy to produce, high yielding and has a high level of food value. It is easy to digest, can be used in different forms and grown under almost every climate. It is produced and consumed in almost all the countries in the world (Anonymous, 2004a).

While foremost countries in potato production are China, Russia, India, U.S.A. and Germany; countries with the highest productivity per hectare are Holland, Germany, U.S.A., France and England, respectively. In Turkey, potato is produced in 200, 000 ha land and total production is approximately 4, 800, 000 tonnes per year. Production per hectare, on the average, is 24 tonnes (Anonymous, 2004b).

As of 2004, the potato plantation area was 5,386 ha in Erzurum. The 44.55% (2400 ha) of plantation was in Pasinler District (Anonymous, 2004c). One of the most important reasons of low level productivity in agricultural

production is the losses stemmed from plant diseases and weeds. One of the most influential and common methods used in fighting diseases and weeds is pest and weed control. Pest and weed control makes it possible to limit the pests and weeds at a level where they cannot cause a significant loss of product, at the same time, protecting the health of people and environment. Such an application increases the productivity in agricultural production. For this purpose, mechanical, physical, biological, biotechnical and chemical control methods are employed. Among these methods against the weeds, chemical method is mostly used. The reason behind the choice of this method is that; it is easier, less costly and shows its impact in shorter time than the others (Gürkan, 2002).

Many studies have been done on the effects of pesticide usage on various products in the world and as well as in Turkey such as: Gair and Sly (1974), Kansu (1982), Akbay (1991), Erkuş et al. (1992), Antle and Pingali (1994), Webster and Bowles (1996), Gökçe (1998), Dağdemir and Birinci (1999), Karadaş (2000), Demircan and Aktaş (2004), Kara et al. (2004). In these studies, it was found that the 2 - 10% pesticide share in total expen-

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tures could decrease the product loss about 35 - 45%. If no fight with diseases applied, around 45 - 50% loss could happen in expected yield (Ecevit and Mennan, 1998). In addition, it was pointed out in these studies that if pesticide usage was applied timely and consciously, there would be no negative effect on human and nature.

The aim of this research is to determine the potato producers' behavior towards using agricultural pesticide and their sensitivity to environment and to determine the value and the level of the pesticide used.

MATERIALS AND METHODS

The primary data used in the research is composed of data gathered through questionnaires on farms and agricultural cooperatives producing potato for the market in the region. Questionnaire were conducted with farmers through face to face survey method. In addition, secondary data collected from the records of related institutions, both public and private, were widely utilized.

As a result of the preliminary work, farms producing potatoes in the region were specified by the help of records of Pasinler District Directorate of Agriculture. The sample size was determined by the Simple Random Sampling taking the scope of the area allocated to potato production by these farms in 2004 as the basic line (Çiçek and Erkan, 1996). In this regard, the significance level was set as 10% and the confidence interval as 90%. Thus, the sample size was determined as 95 farms. Considering the fact that increasing the number of farms in the sample has positive effect on the representation of population and also that some surveys might have lack of information, the sample size was increased by 10% and taken as 105. The research is performed using 95 of these surveys.

The number of farms in the sample is distributed among villages and groups of farm size by taking into consideration production area and the ratio of number of farms in every village to the total number of farms. For this purpose, 9 villages in the region, which constitute 62% of the potato production, were selected through intentional sampling method.

RESULTS AND DISCUSSION

Table 1 shows that 2 cooperatives and 1 pesticide subsidiary in the research region are effective in marketing pesticide. The organizations responsible for pesticide marketing, also market inputs like fertilizer and seed. In all of these three organizations, agricultural engineers are employed. 67.37% of producers obtain pesticides from cooperatives, 27.37% of them from subsidiaries and 5.26% of them from both cooperatives and subsidiaries (Table 1).

According to the results in Table 2, the most important factors affecting the pesticide choices of producers are: whether the pesticides have been used or applied previously and whether they have been suggested by the technicians of Provincial and/or District Directorate of Agriculture or by subsidiaries.

Although the information sources that are utilized while deciding on which agricultural pesticide to use vary, it is identified that, mainly, their own knowledge and experiences and the suggestions of pesticide subsidiaries are

effective in the process.

Table 3 shows that, 33.7% of the producers make their decisions by based on their own knowledge and experiences, 11.58% by considering suggestions of pesticide subsidiaries, 11.58% by considering the suggestions in written sources, and their own knowledge and experiences and finally, 16.84% by considering the suggestions in written sources and suggestions of pesticide subsidiaries. In the study done by Gökçe (1998) in İzmir province, it was found that among the sources producers use, subsidiaries comes first with 29% following technical stuff with 28%. These two study results show the relationship between the East and West of Turkey regarding the characteristics of producers and pesticide usage.

In the study region, the insecticides are mostly used for the potato insects (*Leptinotarsa decemlineata*). The commonly used insecticides for potatoes are the pesticides such as Decis EC 2,5, *Karete* and *Gaucho* which are used to control weeds like green worm (*heliothis armigera*), wireworm (*agriotes spp.*), aphid and potato insect (*Leptinotarsa decemlineata*). Against the leaf burn, subsidiaries declared that they sell pesticides like *arivo*, *sam*, *folikor*, *pommorson* ve *aurometrin* to producers.

According to Table 4, eradication aiming protection is essential for producers' decision process. 46.33% of producers use pesticides before they come across the disease and weeds and 10.53% of them decide to use pesticides after realizing the existence of disease and weeds in their own fields (Table 4).

Generally, 86% of the producers use pesticides before they come across disease and weeds in their field and gardens. Producers in the research area use the same pesticide generally for pest control. In the region, the producers use agricultural pesticides with the same active element consecutively for a long time, frequently and without changing it.

Continual consumption of products having residual of pesticides may lead consumers to be poisoned. In order to lessen these risks, which is very important for human health, the time needed between harvest and the last pesticide application should be considered meticulously.

As shown in Table 5, 11.58% of the producers have declared that washing may remove residual of pesticide, 45.26% that chemical pesticides do not leave residual, 28.42% that some chemical pesticides may leave residual and 14.74% that they have no idea or information about the problem of residual of chemical pesticides on the products. According to these, as for the problem of residual, it is obvious that the producers are not conscious enough and 71.58% of them need to be informed of the problem. 48.42% of the producers throw the packages carelessly to the environment after using pesticides, 29.47% of them destroy by burning, 16.84% bury in earth and 5.27% throw as garbage in nylon bag (Table 6).

In this table, it is indicated that, apart from using pesticides, the most important eradication method applied

Table 1. Sources of inputs obtained by farmers.

Organizations	Pesticide		Fertilizer		Seed	
	(Unit)	Percentage (%)	(Unit)	Percentage (%)	(Unit)	Percentage (%)
Subsidiaries	26	27.37	37	38.95	22	23.16
Cooperatives	64	67.37	50	52.63	17	17.89
Sub. + Coop.	5	5.26	8	8.42	1	1.05
Within the farm	-	-	-	-	55	57.90
Total	95	100.00	95	100.00	95	100.00

Table 2. The factors affecting the pesticide choices of producers.

Factors	Insignificant (Unit)	Significant	
		(Unit)	Percentage (%)
Being used before	34	61	64.21
Suggestions of friends-relatives	85	10	10.53
Suggestions of subsidiaries	35	60	63.16
Suggestions of provincial/district directorate of agriculture	77	18	18.95
Appropriate price	92	3	3.16
Famous brand name	90	5	5.26

Table 3. Information sources that producers benefit while deciding.

Information Sources	Person (Unit)	Percentage (%)
a - Suggestions in written sources	9	9.47
b - Knowledge and experience of producers	32	33.68
c - Suggestions of neighbors and relatives	6	6.32
d - Suggestions of pesticide subsidiary	11	11.58
e - Suggestions of provincial/district directorate of agriculture	3	3.16
a + b	11	11.58
a + d	16	16.84
b + d	4	4.21
c + d	3	3.16
d + e	1	1.10
Total	95	100.00

Table 4. Criteria considered by producers when deciding to use pesticides.

Criteria considered for using pesticides	Person (unit)	Percentage (%)
a - Observing disease and weeds in fields and gardens	10	10.53
b - Observing disease and weeds in the fields and gardens of neighbors or relatives	1	1.05
c - Considering the suggestions of provincial and district directorate of agriculture	1	1.05
d - Considering the suggestions of subsidiaries of pesticides	-	-
e - Using pesticides on protection purposes before disease and weeds are observed	44	46.33
a + b	1	1.05
a + e	35	36.84
d + e	1	1.05
a + c + e	1	1.05
a + d + e	1	1.05
Total	95	100.00

Table 5. Producers' opinions about the residual of pesticide used.

Producers' opinions about the residuals of pesticide used	Person (unit)	Percentage (%)
a - Washing may remove residual of pesticide	11	11.58
b - Chemical pesticides don't leave residual	43	45.26
c - Some chemical pesticides may leave residual	27	28.42
d - They have no idea or information about the problem of left residual of chemical pesticides on the products	14	14.74
Total	95	100.00

Table 6. Destruction methods of producers for pesticide packages.

Evaluation of pesticide packages by producers	Person (unit)	Percentage (%)
a - Throwing packages to the environment carelessly after applying pesticide	46	48.42
b - Destroying the packages by burning after applying pesticide	28	29.47
c - Burying the packages in earth after applying pesticide	16	16.84
d - Throwing the packages to waste in nylon bag after applying pesticide	5	5.27
Total	95	100.00

by all of the producers in the region is removing the weeds by hand or hoe. 98.95% of the farms producing potatoes implement the crop rotation regularly. Because of the abundance of irrigated land in the farms, while potato production continuously takes place in different fields every year, 3 years rotation is applied to the field cultivated for potato. This application is preferred in order to lessen the losses caused by disease and weeds.

Since the potato insect is widespread for potato in the region, cultivated by cereal in the previous year or left idle are generally preferred for production. Since the harms caused by disease and weeds are high, production cannot take place without applying pesticides.

All farms in Pasinler district use pesticide besides natural fight in potato production. In this study, it was identified that the producers throw the packages carelessly to the environment after using pesticides and that caused the death of several cattle in the region. In addition, due to not using mask and gloves during application of pesticide some people were poisoned. Therefore, to minimize these risks that pesticides cause the producers must follow the instructions for application and disposal. In this respect, producers should be informed by Agricultural agencies and Universities. Furthermore, pesticide manufacturers and marketing firms can induce potato producers to recycle their pesticide packages. This way, the firms will contribute to environmental protection substantially.

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