

Determining The Pesticide Usage and Current Situation About Empty Pesticide Containers: A Case of Sakarya (TR) Province

¹Ömer Hulusi Dede

¹ Faculty of Engineering, Department of Environmental Engineering Sakarya University, 54187, Sakarya TURKEY

Abstract

In this study, performed to determine the level of pesticide usage and the level of the problems caused by empty pesticide containers, a questionnaire prepared by researcher in accordance with the literature was implemented in Sakarya Province. Although Sakarya Province advanced in industry and trade is still an important agricultural production area. Therefore, the results obtained from this study are suitable for a projection across the Turkey about this issue. 75% of the participants stated that they have not received any training about the pesticide usage and disposal of pesticide containers, but will participate if such a training activity to be organized (78%). Nearly half of respondents (48%) use five or more pesticide containers in various sizes in a year. The majority of respondents are aware of the pesticide containers is dangerous for human and animal health (88%) and considers that this wastes should be collected (89%). It was determined that 9% of the participants themselves or their family members has experienced health problems originating from the preparing or spraying pesticides or their containers. When the severity of the health problems caused by pesticides considered this rate were assessed as very high. According to the results obtained in this study it was determined that a significant amount pesticide containers waste occurs the result of agricultural activities, an ordered collection and disposal system for this wastes is not available, this situation poses a threat to human and animal health and an important environmental pollution risk.

Key words: Pesticides, empty pesticide containers, disposal of hazardous waste

Pestisit Kullanımı ve Boş Pestisit Ambalajları ile İlgili Mevcut Durumun Belirlenmesi: Sakarya (TR) Örneğinin İncelenmesi

Özet

Pestisit kullanım düzeyinin belirlenmesi ve boş pestisit ambalajlarının yol açtığı sorunların düzeyinin tespiti için yapılan bu çalışmada, Sakarya İli genelinde anket çalışması uygulanmıştır. Sakarya İli sanayi ve ticarete ilerlemiş olmasına rağmen, hala önemli bir tarımsal üretim alanıdır. Bu nedenle burada elde edilen sonuçlar Türkiye genelinde konu ile ilgili projeksiyon yapılması için uygundur.

Ankete katılanların %75' i zirai ilaç kullanımı ve ambalajlarının bertarafı konusunda herhangi bir eğitim almadığını, ancak böyle bir eğitim faaliyeti düzenlenirse katılacağını (%78) ifade etmiştir. Katılımcıların yaklaşık yarısı (% 48) çeşitli boyutlarda olmak üzere yılda beş veya daha fazla zirai ilaç ambalajı kullanmaktadır. Ankete katılanların büyük bölümü zirai atık ambalajlarının insan ve hayvan sağlığı açısından tehlikeli olduğunu farkındadır (%88) ve bu atıkların toplanması gerektiğini düşünmektedir (% 89). Katılımcıların % 9'unun kendisi veya aile fertleri, zirai ilaçları kullanıma hazırlama, ilaçlama veya ambalajlarından kaynaklı olarak sağlık sorunu yaşamıştır. Pestisitlerden kaynaklanan sağlık sorunlarının ciddiyeti göz önünde bulundurulduğunda bu oran oldukça yüksek olarak değerlendirilmiştir.

Bu çalışmadan elde edilen sonuçlara göre, tarımsal faaliyetler sonucu önemli ölçüde pestisit ambalaj atığı oluştuğu, bu atıklar ile ilgili düzenli bir toplama ve bertaraf sistemi bulunmadığı, bu durumun insan ve hayvan sağlığını tehdit ettiği ve önemli bir çevre kirliliği riski oluşturduğu belirlenmiştir.

Key words: Dust, aas, icpoes, disposal tank, urbanization (should be a maximum of 5 keywords)

*Corresponding author: Faculty of Engineering, Department of Environmental Engineering Sakarya University, 54187, Sakarya TURKEY. E-mail address: ohdede@sakarya.edu.tr, Phone: +902642955761

1. Introduction

Pesticides which are started to use by looking at the main purposes of satisfying the food requirement of a rapidly rising human population and increasing the agricultural production have a too large usage area as both sort and amount as well at the present time [1,2,3]. Pesticide usage with its more than 500 types is seen as a significant necessity to sustain the production as well quality and uninterruptedly in almost all large scaled cultivated areas and being worked for destroying the insects, rodents, and crabgrasses by pesticide use [4,5]. Moreover, the pesticide use is not only limited to the cultivated areas but also occasionally appealed for destroying pests in living quarters of people also [6].

The agricultural pesticides directly concern the subjects like health, food, and environment because of the problems when it is not used in proper conditions and amount as well even though its main usage area is agricultural activity [7]. The deaths and serious health problems reasoned these pesticides during and after spraying reach significant dimensions at the present time when approximately 2,5-3 million ton pesticides are applied in cultivated areas per year across the globe [8,9,10,11]. Emphasized in several research in literature that health problems are rather widespread in developing and underdeveloped countries based upon the misuse of pesticides and these health problems bring heavy costs for healthcare systems of these countries and rural over the long run [12].

The risks revealed by this circumstance are not limited with misuse of pesticides. An important problem about the subject that throwing the empty agricultural pesticides to natural habitat or garbage containers for domestic wastes unrestrainedly besides usage of pesticides unconsciously and more than adequate. The pesticide packages destroyed by appropriate methods after using have a potential can cause huge problems in terms of environment and human health [13]. The risks for human health, food safety and natural habitat of pesticides are rapidly reaching far great dimensions by the reason of high population density all around the world and close-range between city and rural areas nowadays [14].

It is aimed in this research prepared for the solution of the problem by considering the important risks it has and the negativities based upon the current situation that determining the approachment and awareness level about pesticide usage of farmers live in rural and as primary users and providing the necessary knowledge to reveal an ecologic, economic and sustainable collect and destroy model for empty pesticide packages.

2. Material and Method

The survey study is applied in villages selected as activity area in this research made for determining the existed amount and sorts of agricultural protection pesticides and sort, size and current situation of empty pesticide packages. It is tried to determine via this survey study that amount of use of pesticide, size and sorts (glass, metal, carton, plastic, etc.) of pesticides and available destroying methods in application field of pesticide packages. Furthermore, tried to determine the knowledge levels and tendencies of our rural farmers about effective use of agricultural protection pesticides, use of agricultural protection pesticides in the world and current spraying technologies, machine and equipment for spraying, safety measures which are needed to take and principles, health problems they can face with during and after spraying, legal legislation and possible punishments, proper cleaning techniques and destroying methods of empty pesticides.

The villages of Dereköy (Serdivan), Çökekler (Adapazarı), Çengel (Geyve), Büyük Esence (Erenler) in Sakarya City are chosen as the activity area of the research. The agricultural potential they have, population and raised agricultural productions (field crops, garden plants, fruit growing) are considered in the selection of these villages. The selected villages have the characteristics which are enabled to projection to large areas seen similar production designs and presenting the whole city of Sakarya by taking into account all of these selection criteria.

The information about the institution apply the survey and the purpose is shared with the attenders at the start of the survey. There are totally 14 questions in the survey except the personal information like age, job, gender, and educational background. On the other hand, these questions except questions about determining the personal information could be separated into three groups as specifying the usage dimensions of pesticides, revealing the current situation and specifying the tendencies. The specific value ranges are given to the attender in questions and asked him to choose the best one of these value ranges for himself for determining the frequency of occurrence, amount, and volumes of empty pesticide packages. Demanded attenders to mark one of the options that yes-no and no idea in questions for determining their available attitude and tendencies about pesticide use and empty pesticide packages. Besides that, demanded them to mark the option which is closest to their opinion in questions about collecting and destroying the empty pesticide packages. Again demanded them to write their own opinion by marking the ‘other’ option if there is not any favorable one.

3. Findings and Discussion

Within the context of this research made for determining the usage level of agricultural protection pesticides and problems arising from empty pesticide packages, the results of the survey study applied in pilot villages in Sakarya City borders as follows.

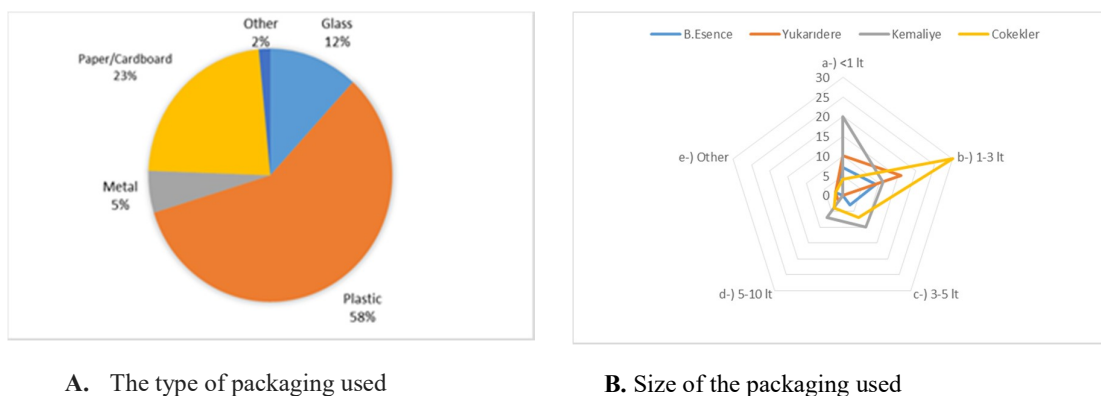
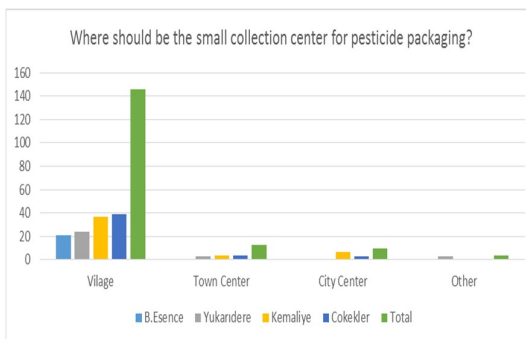
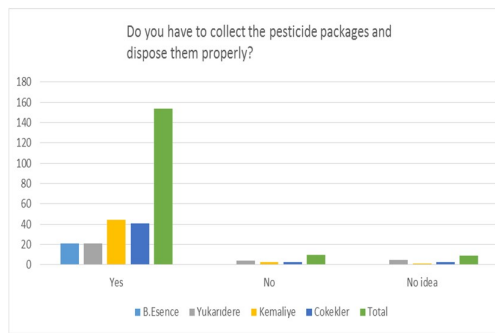
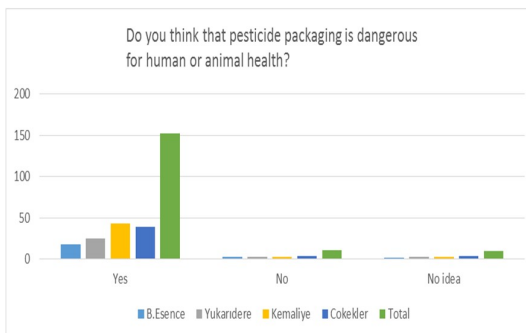
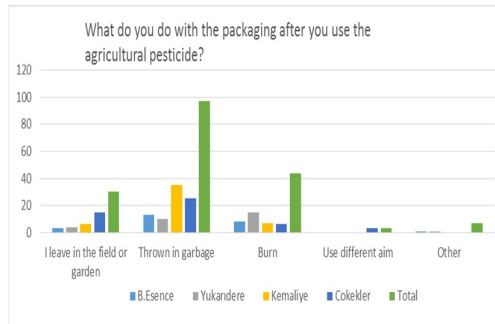
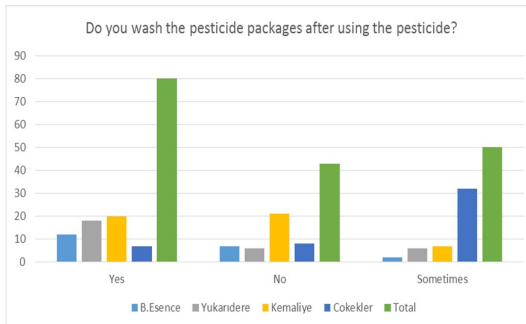
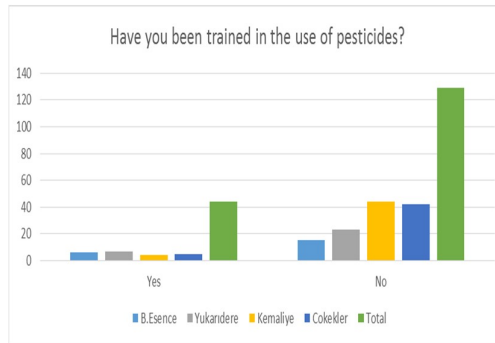
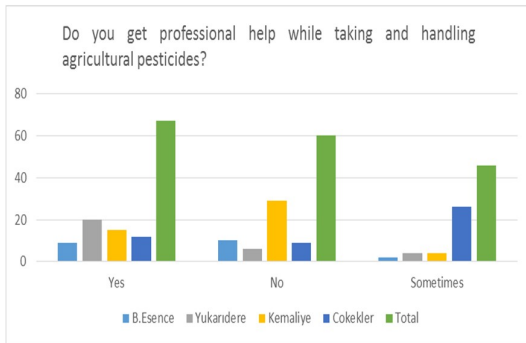


Figure 1. Distribution of sort and size of empty pesticide packages

Seen that the 56% of the pesticide packages composed of plastic packages, 19% of them composed of paper/carton packages, glass, and metal packages are almost the same amount and the commonly used package sizes are 1-3 litres ones (Figure 1. A-B)



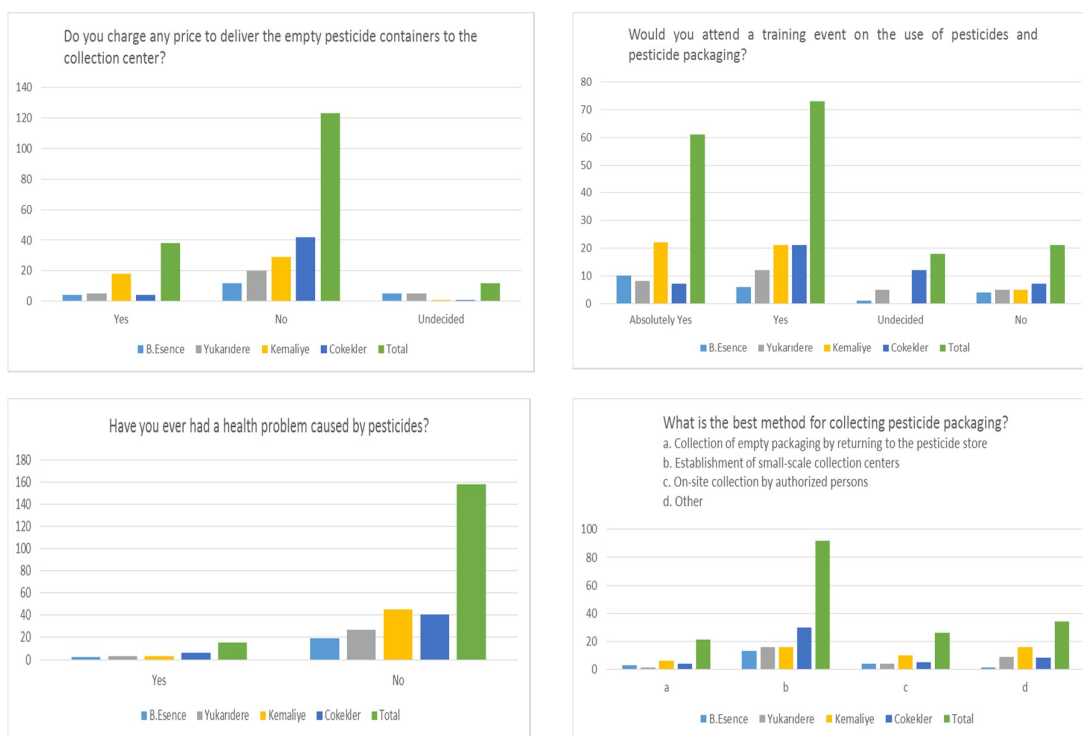


Figure 2. Distribution of answers and results for survey questions by villages

9% of attenders himself or family members had health problems based on preparing the pesticides to use, spraying or packages. This ratio is accepted pretty high when considering the seriousness of these health problems arising from the pesticides. Several research exist in literature about the deaths and the health problems arising from the pesticides during and after the use. Mentioned in these research in developed countries that tens of thousand of people, especially farmers apply to hospital and most of them die by the reason of the pesticides per year [11]. Again mentioned in a research of World Food and Agriculture Organization in 2000 that 3 millions of people worldwide are directly or indirectly effected by the pesticides and approximately 200 thousand of them die [15].

In addition to this, the answers of survey questions show that used pesticide packages are generally thrown to field and land-sides (17%) or public use litter baskets (53%). Half of the survey attenders (48%) have been using the pesticides since 5 years or more. Clearly seen that these wastes which are accepted as dangerous wastes without any necessary cleaning processes will cause to increase the environmental and health risks by sticking to domestic wastes in litter baskets.

75% of survey attenders stated that they did not take any education about pesticide use and package destroy, but 78% of them said they will participate if an education activity is organized. The large part of attenders are aware of the danger of pesticide packages in terms of human and animal health (88%) and think about to be collected these wastes as well (89%). But the thoughts of our rural farmers in practice remain limited. This condition matches with the results of the researches made about farmer attitudes and tendencies for pesticide use in Greece, Brazil, Nepal and suchlike many countries. For example, mentioned in a research in Greece that the farmers generally use the pesticides more than the field needs despite they are informed of the

detrimental effects of pesticides for natural habitat and human health. These farmers explained the reason of this as the thought of destroying the pests by more pesticides [16]. Reported in research in Brazil and Nepal that a large part of farmers try to obey the rules during and after the spraying, for instance almost all do not eat, drink or smoke during the spraying and more than half of them take bath after the spraying; on the contrary the number of deaths and the health problems are too many because of the manual and old technologies in use of spraying [17,18].

At the same time, the attenders mentioned that the most efficient collecting operations can be possible by small-scaled collection centers (53%) and these centers need to be in villages also (84%). The important part of the attenders said that they could deliver these wastes to collection trucks or villages (76%) and would not ask for a fee (71%).

Determined when the results from survey study are evaluated as a whole that vast amount of pesticide packages are originated by agricultural activities, there is not a regular collection or destroy system, these circumstance threatens the human and animal health and occurs a significant pollution. In addition to this, clearly seen that the people use these pesticides are pretty sensitive for the subject and want to learn more about the pesticide packages.

4. Results

The application areas of agricultural activities are directly inseparable whole with the land and water sources we called as natural habitat. Consequently, every kind of waste occurs during or after the agricultural activities become directly a threat to land and water sources. The pollution of plant wastes, stalks, straws or tree branches in fields are limited because of the wearing off in nature by time. But especially the residuals of the pesticides and empty pesticide packages do not wear off in nature automatically, so they become serious pollutants. Therefore, the waste management is the primary subject. When considering the wideness of application areas of agricultural activities, clearly seen that these pesticide wastes can spread on a large area if they are thrown to nature and not possible to collect them again. That's why there is need to collect pesticide wastes by a functional operation before throwing to nature and transport to the destroying facilities immediately. This research made by looking at this necessity revealed that creating an ecologic, economic and sustainable collecting and destroying model is a crucial necessity for natural habitat and human health. Moreover resulted in this research that increasing the applicability of the collecting and destroying model is possible with establishing a work and information network between farmers, seller companies, related public bodies, and nongovernmental organizations.

After all, understood that using pesticides unconsciously and more than enough and throwing the wastes to waysides and land-sides or garbage containers for domestic solid wastes are the focal spots of the problems about the subject. After evaluating the data as a whole after this research, things to do for reducing the misuse of pesticides and developing/applying an ecologic, economic and sustainable model for empty pesticide packages are lined up below.

- Increasing the knowledge level about correct use of agricultural protection pesticides
- Avoiding the unnecessary and more than enough use of pesticides and so reducing the costs by reducing agricultural inputs
- Informing our farmers about security measures during and after the spraying

- Developing a sustainable collecting and destroying model for agricultural protection pesticide packages.
- Establishing the collecting stations in villages for collecting the empty pesticide packages.
- Protecting the land and water sources by avoiding the pollution based on pesticide packages
- Avoiding the increase of dangerous wastes volume by sticking the agricultural pesticide packages called dangerous wastes to domestic ones.

References

- [1] Van der Hoek, W., Konradsen, F., Athukorala, K., Wanigadewa, T., 1998. Pesticide poisoning: a major health problem in Sri Lanka. *Soc. Sci. Med.* 46, 495–504.
- [2] Hurtig, A.K., San Sebastian, M., Soto, A., Shingre, A., Zambrano, D., Guerrero, W., 2003. Pesticide use among farmers in the Amazon basin of Ecuador. *Arch. Environ. Health* 58, 223–228.
- [3] Maria Celina P. Recena, Eloisa D. Caldas, Dario X. Pires, Elenir Rose J.C. Pontes, 2006. Pesticides exposure in Culturama, Brazil—Knowledge, attitudes, and practices. *Environmental Research* 102 (2006) 230–236.
- [4] Azevedo, A.S.O.N., 1998. Assessment and simulation of atrazine as influenced by drainage and irrigation. An interface between RZWQM and ArcView GIS. Doctor Thesis. Iowa State University, Ames, Iowa.
- [5] Arias-Estevez, M., Lopez-Periago, E., Martınez-Carballo, E., Simal-Gańdara, J., Mejuto, J., Garcıa-Rıo, L., 2008. The mobility and degradation of pesticides in soils and the pollution of groundwater resources *Agriculture, Ecosystems and Environment* 123, 247–260.
- [6] Cooper, J., Dobson, H., 2007. The benefits of pesticides to mankind and the environment. *Crop Production* 26, 1337-1348.
- [7] Soares, W., Almeida, R.M.V.R., Moro, S., 2003. Rural work and risk factors associated with pesticide use in Minas Gerais, Brazil. *Cad. Sau´ de Pu´ blica* 19, 1117–1127.
- [8] Rao, P.S.C., Bellin, C.A., Brusseau, M.L. (1993) In *Sorption and Degradation of Pesticides and Organic Chemicals in Soil*. SSSA Special Publication Number 32, Wisconsin, pp. 1-26
- [9] Hayo M.G. van der Werf, 1996. Assessing the impact of pesticides on the environment, *Agriculture, Ecosystems and Environment* 60, 81-96.
- [10] Wilson, C. (2000) Environmental and human costs of commercial agricultural production in South Asia. *J. Social Econ.* 27 816-846.
- [11] Wilson, C., Tisdell, C. (2001) Why farmers continue to use pesticides despite environmental, health and sustainability costs? *Ecolog. Econ.* 39 449-462.
- [12] Atreya K., 2007. Pesticide use knowledge and practices : A gender differences in Nepal. *Environmental Research.* 104, 305-311.
- [13] Margni, M., Rossier, D., Crettaz, P., Jolliet, O., 2002. Life cycle impact assessment of pesticides on human health and ecosystems, *Agriculture, Ecosystems and Environment* 93, 379–392.
- [14] Van der Werf, H.M.G., 1996. Assessing the impact of pesticides on the environment, agriculture ecosystems. *Agric. Ecosys. Environ.* 60, 81–96.
- [15] Food and Agricultural Organization, 2000. Project Concept Paper. HEAL: Health in Ecological Agricultural Learning, prepared by the FAO programme for community IPM in

Asia, Food and Agricultural Organization of the United Nations, Rome, <http://www.fao.org/nars/partners/2nrm/proposal/9-2-6.doc>.

[16] Lithourgidis, C. S., Stamatelatu, K., Damalas, C. A., 2019. Farmers' attitudes towards common farming practices in northern Greece: implications for environmental pollution, *Nutr Cycl Agroecosyst* (2016) 105:103–116, DOI 10.1007/s10705-016-9778-x.

[17] Recena, M. C. P., Piresa, D. X. P., Caldasb, E. D., 2006a. Acute poisoning with pesticides in the state of Mato Grosso do Sul, Brazil, *Science of the Total Environment* 357 (2006) 88–95.

[18] Recena, M. C. P., Caldasb, E. D., Piresa, D. X. P., Pontesc, E. R. J. C., 2006b. Pesticides exposure in Culturama, Brazil—Knowledge, attitudes, and practices, *Environmental Research* 102 (2006) 230–236.