

## Research Article



# A Knowledge, Agricultural Practices, Health and Management Survey Related to Pesticide Applications in Peach Orchards of Swat, Malakand

Shazia Akhtar<sup>1</sup>, Abdul Samad<sup>1\*</sup>, Afshan Gohar<sup>1</sup>, Muhammad Munir Shahid<sup>2</sup>, Muhammad Ishtiaq<sup>1</sup>, Arslan Sarwer<sup>1</sup>, Adnan Khan<sup>1</sup> and Karam Ahad<sup>1</sup>

<sup>1</sup>National Pesticides Residues Monitoring System in Pakistan, Ecotoxicology Research Program, NARC, Islamabad, Pakistan;

<sup>2</sup>Pakistan Agricultural Research Council (PARC), Islamabad, Pakistan.

**Abstract** | As an initial part of a program aimed at development of pesticides residues monitoring system in Pakistan, a semi-structured questionnaire survey consisting of 40 sub questions was evaluated by interviewing the peach growers in Swat, Malakand. The current survey described the knowledge, behavior, agricultural practices and pesticides toxicity symptoms among the field workers. Over all 72 orchards from 26 Union Councils were covered. Data was analyzed by using SPSS 21 and sample collection points were presented on map by using software Arc GIS. The response of interviewers was high which indicates their intentions to facilitate the present study. It was found that 12 varieties of peaches are being grown in the selected area. A total 28 pesticides were found which are being used on peach trees. It was noted during the survey that 98.6% respondents were unaware when to apply pesticides and they apply them on all growth stages of peach tree. Moreover, exposure to pesticides occur from skin absorption and through inhalation. This emphasizes on the launching of extension programs on pesticide alternatives. It is concluded that field workers in Swat Malakand, extensively uses pesticides and in spite of their awareness about pesticides effects their protective measures are very poor. The low level of awareness in the study area and the public health and environmental consequences resulting from the misuse of pesticides is alarming. Proper training is required to handle the pesticides for farmers in peach orchards of Swat, Malakand Division. There should also be monitoring of the health status of farm workers.

Received | October 01, 2019; Accepted | November 20, 2019; Published | January 20, 2020

\*Correspondence | Abdul Samad, National Pesticides Residues Monitoring System in Pakistan, Ecotoxicology Research Program, NARC, Islamabad, Pakistan; Email: samadbiochemist@gmail.com

Citation | S. Akhtar, A. Samad, A. Gohar, M.M. Shahid, M. Ishtiaq, A. Sarwer, A. Khan and K. Ahad. 2019. A knowledge, agricultural practices, health and management survey related to pesticide applications in peach orchards of Swat, Malakand. *Pakistan Journal of Agricultural Research*, 33(1): 56-62.

DOI | <http://dx.doi.org/10.17582/journal.pjar/2020/33.1.56.62>

Keywords | Peach, Survey, Diseases, Pesticides usage, Data analysis, SPSS

## Introduction

Being an agricultural country, Pakistan's economy mainly depends on good crop yield (Iqbal and Ahmad, 2005). Every year Pakistan is suffering economic losses due to pests and plants diseases. On the other hand, increasing use of pesticides has been observed every year. Use of pesticides increased 23212 tons to over 69897 tons during 1994 to 2002

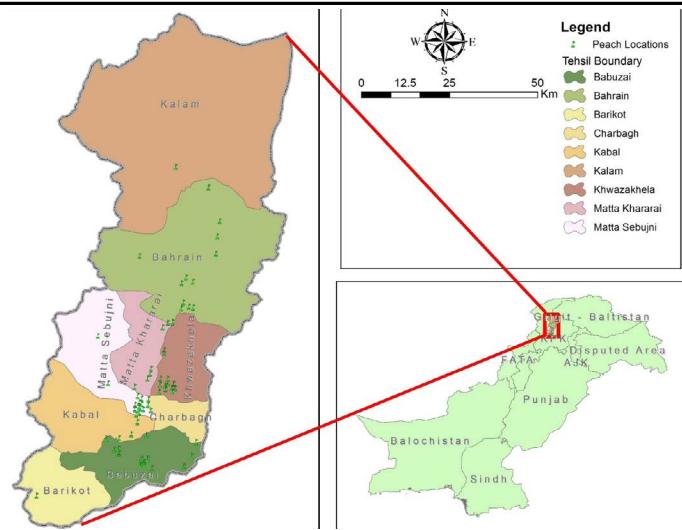
(Khooharo et al., 2006). At present about 3290 pesticides are registered by generic name and 1020 by brand name having about 209 number of active ingredients (Khooharo, 2008). This increasing scenario of pesticides usage can be controlled by applying appropriate management system of pesticides residues monitoring in Pakistan. To manage pesticides problem this study was planned to assess the application of pesticides, awareness and

assessment in peach growing area of Swat Malakand. So that precautionary measure might be adapted to reduce the risks caused by pesticides contamination.

Peach is very important stone fruit and temperate in nature. Cling and free stone are two important cultivated type of peaches produced world-wide. In Pakistan early grand, Florida king 6-A and 7, 8, 9 numbers are the most popular cultivars. Whereas in Baluchistan, Golden early, Shah Pasand and Shireen are grown (Zeb and Khan, 2008). Pakistan is at 25<sup>th</sup> number in the world in peaches and nectarine production. Pakistan has peach share of 0.3% in the world. In Swat 80% peach of Pakistan is being produced (Khan et al., 2008). During 2015-2016 70750 tons of peach was produced in Pakistan from which 52005 tonnes was produces in KP (Swat). This peach is exported to Hong Kong, Saudi Arabia, Afghanistan, Bahrain, Kuwait, UAE and UK (Syed et al., 2014). All stone fruits suffer from a destructive disease caused by fungi known as Brown rot, Leaf curl, Scabs and Cankers etc. Not only fungi, bacteria also cause diseases in the stone fruits like Bacterial spot and Crown gall. Pesticides are sprayed on peaches at all stages of peach growth as different diseases occurs in peaches at different stages (Bush et al., 2009). Annually peach production losses are 21-25% due to diseases and pests (Nafees et al., 2008). Many synthetic pesticides are being used to protect the peach fruit form diseases. To manage agricultural problems assessment of problem is basic step. The present study was design to assess the conventional cultivation practices in peach orchards of Malakand Division.

## Materials and Methods

The present study was carried out to collect the primary data about peach cultivation, production agricultural practices, pesticides usage, awareness, effects and pest management etc. Survey was planned during 2017-2018. In the study area 26 Union Councils were included. A comprehensive questionnaire was designed which comprises 40 sub questions. The data was recorded by conducting person to person interview. Data was analyzed by using SPSS 21 software. Different descriptive statistics e.g. measure of central tendency, frequency polygon, percentages and pie charts etc. were applied on the data to present it in a most appropriate form.



**Map 1:** Surveys questionnaire interweaving locations in Malakand.

## Results and Discussion

The present study was designed to evaluate the agricultural practices, pesticide usage, awareness and pest management in peach orchards of Malakand, Division, Khyber Pakhtunkhwa, Pakistan. Overall seventy orchards were covered, a well-structured and comprehensive questionnaire consisting of 40 sub questions was evaluated by interviewing the peach growers. The findings of the study are demonstrated below.

### Personel information of respondents

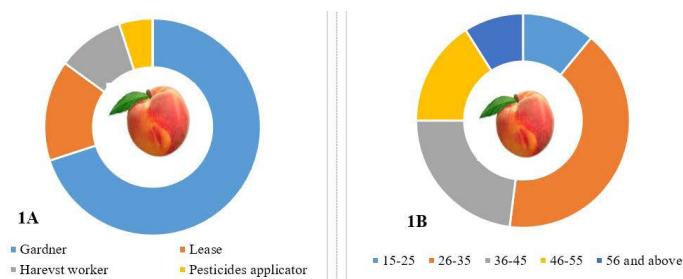
It was found from the survey that mostly the peach growers were found to be owner cultivators and hence were found managing their land themselves i.e. 80.3%, whereas many of the respondents 14.1% were found having gardener, 2.8% were leaser the orchard form owner and 1.4% were harvest worker as represented in Figure 1A.

The respondents interviewed were classified into five age groups i.e. peach growers having between 15-25, 26-35, 36-45, 46-55 and above 56 years, as is obvious from the figure most of the peach growers i.e. 40.8% were having their age between 26-35 years. Those having between 15-25 years were found to be 11.3%. While those having age between 36-45 years were to be 22.5%. the age between 46-55 years were to be 15.5% and above 56 years were found to be 8.5% (Figure 1B).

The respondents as classified on the bases of number of years of schooling were grouped into distinct categories including those having formal education

up to primary level, Middle, Matric, Intermediate, Graduation and illiterate. Most of the peach farmer were graduate i.e. 32.4% followed by those having education up to Primary 2.8% and almost 20% were illiterate.

According to the survey report, conducted in Malakand Division for the purpose of pesticide residue quantification total 70 respondents were interviewed. Among the respondents majority (77.5%) were married while approximately one third (21.1%) were unmarried. From the data it is concluded that the peach formers of the area are mature and keen to their job, to earn their life and for their families as well.



**Figure 1:** Percentage of peach grower (A) status of cultivators (B) age group of farmers.

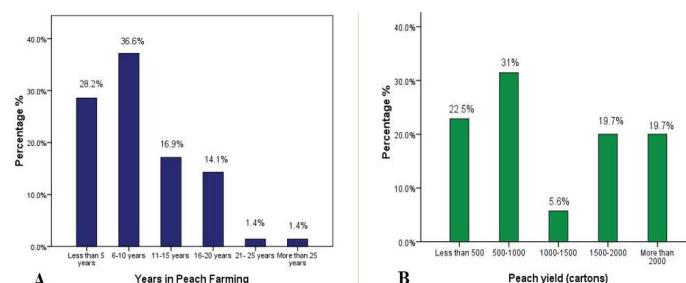
#### Peach cultivation, production and pesticides usage

Information regarding the peach forming experience was gathered from the peach grower. Almost all peach growers were actively involved in the enterprise. As recorded during the survey, maximum number of respondent (36.6%) have 6–10 years' experience of peach cultivation. While 28.2% of total interviewed formers have less than 5 years of peach growing experience. The most experienced (in terms of forming period) peach growers were 1.4% among the respondent included in our survey i.e. 25 and more than 25 years of peach forming experience. Furthermore, 16.9% and 14.1% of the respondents have forming experience of 11–15 years and 16–20 years respectively in this regard. It may be concluded that the formers were young and highly educated thus they could understand the forming ethics and pesticides merits and demits as well (Figure 2A).

It is reported that 22.5% formers produced less than 500 cottons of peach per variety, while the highest number of formers (31%) included in this produced 500–1000 cottons per variety. 1000–1500 cottons of peach production were reported by only 5.6%. Besides, both 1500–2000 and more than 2000

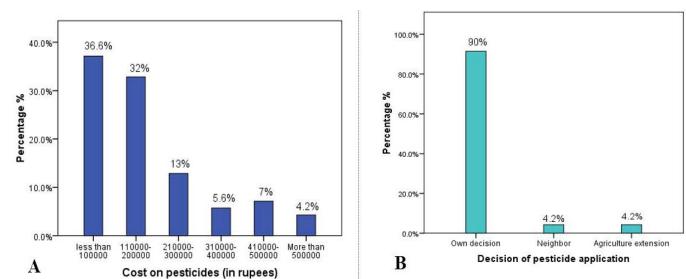
#### Survey related to pesticide applications in peach orchards

cottons peached productions were reported by each of 19.7% of formers. This variation of peach production may be due to the variety and area (in square feet) of land under peach cultivation, as during survey it was observed that some formers have larger orchard as compared to other having small one.



**Figure 2:** (A) Years in peach farming experience (B) Peach yield in cartons.

As the basic objective of the survey was to evaluate the quantitative measurement of different pesticides used in peach production, therefore, we select only those formers who used pesticides for pest control. Highest number of formers reported that the cost on pesticide is ranging from 100000 to 200000 (36.6 spent less than 100000, 32.4% spent 110000–200000). Formers who spent maximum of 300000, 400000 and 500000 were 12.9%, 5.6% and 7%, respectively, while 4.2% formers spent more than 500000 rupees for pest control in peach production in a season. As the area under peach cultivation and pesticide products were varies among forms therefore the cost varies (Figure 3A).



**Figure 3:** (A) Pesticides cost in PKR, (B) Decision for pesticides usage.

In this survey there were 70 respondent and responded differently according to their previous practices. As shown in the Figure 3B, 64 (90.1%) respondents exposed that they have used pesticide by their own decision. Similarly, 3 (4.2%) individuals were uninformed of pesticide usage but were convinced by other formers and neighbors. The third bar represents agriculture extension i.e. 3 (4.2%) shows that these respondents have taken information from agriculture extension regarding pesticide usage.

It is crystal clear from the survey that people of the specified area rely on agriculture. The major portion of their income depends on agriculture sector. It is essential here, to elaborate this graph in simple words. There were a lot of orchards in Swat. The proportion of their ownership is narrated as: the percentage of individuals who has 1 to 2 orchards is 28.28 whereas, 3-4 is 36.6%. It shows that they are greatly interested in agriculture sector because 36.6% is a very huge figure.

#### *Application formulations, storage disposal and consultation about pesticides usage*

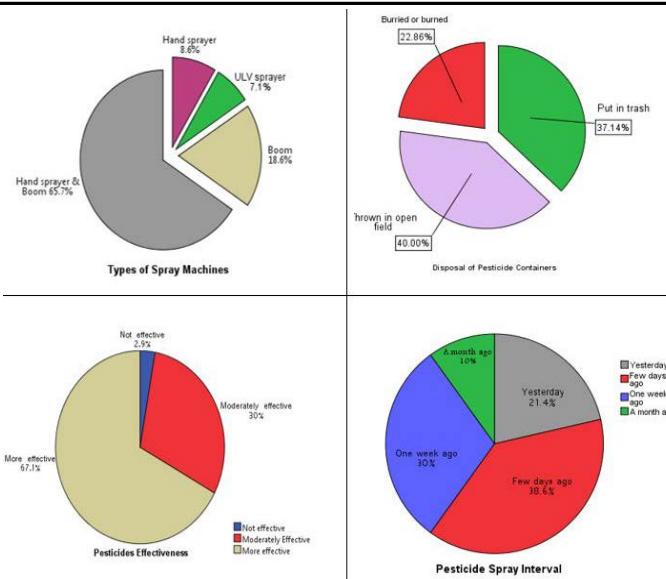
The main formulations for pesticides being used in Malakand Division were (EC) Emulsifiable concentration, WP) wet able powder dust and granule forms. The respondents who used hand for dust application were 1.4% those who used powder sack were 0% whereas (97.1%) used mixed methods for EC, WP formulation of chemical pesticide application.

The information collected about placing the pesticide varies among the respondents. Some of the peach growers i.e. 94.3% were found to stored pesticide in field and 4.3% were keeping it in the homes. Approximately 1.4% were found keeping the pesticide in a separate store

For the spray of pesticides, equipment are the essential tools. This is concluded on the basis of the data recorded from the respondents that majority of the respondents i.e. 65.7% were using hand sprayer and boom however only hand sprayers were 8.6%. ULV sprayer were 7.1% and only boom is 18.6% (4A).

The respondents identified several ways regarding the disposal of the pesticide/chemical containers. The peoples were not aware the proper way of disposal and its hazardous nature .40. % respondents thrown in open field. 37.14% put and trash. While 22.86% respondents show sensible attitude and they buried or dump 4B.

For the effective control of both insect and disease it is essential to apply pesticides at the appropriate method it was noted during the survey that 98.6% respondents were unaware when to apply pesticide the apply on all stages and only 1.4% apply on flowering stage means none is aware about the proper use of pesticides 4C.



**Figure 4:** Types of spray machines (A), Disposal of pesticides container (B), Pesticides effectiveness (C) and Spray interval (D).

Pest cause serious losses in terms of quality as well as quantity. Pest and diseases management are essential for producing quality and quantity of peaches a large number of respondents 91.4% were found consulting retailer about the right use of pesticide. Only 5.7% peoples were known about consultancy services while 2.9% were depends on neighbors.

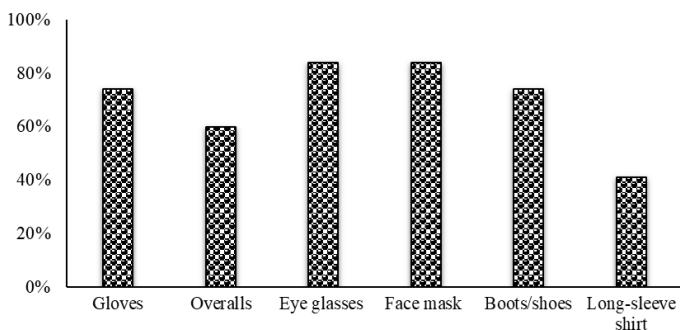
Only 20% respondents were answered that they have familiar about agriculture consultation while mostly 80% peoples were don't have agriculture facilities. A red question mark on the loyalty with his duty of government agriculture extension officer that i.e., 98.6% respondents were answered that there was no availability of consultation form agriculture extension. While only 1.4% respondents partly consultation services were available to him.

#### *Pesticides trainings and safety measures*

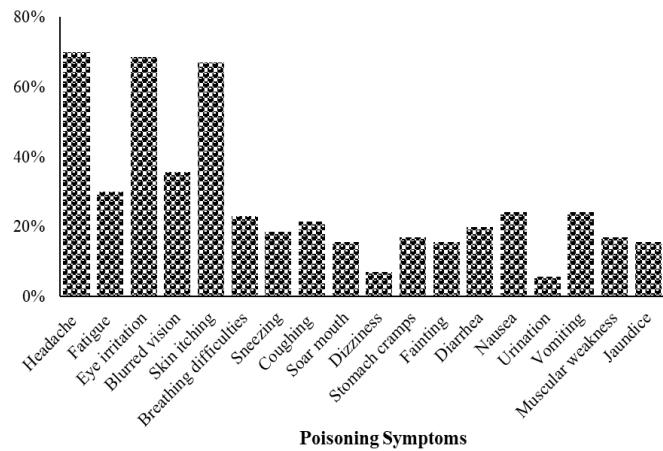
It was found during the survey that only 1.4% peach farmer were having attended course of training. Majority of respondents were unaware of it as 97% of peach farmer have not attended any courses on the peach farming even they don't about the government conduct training etc. Proper doses of pesticide is most important if farmers were educated about the proper dosage the residual effect well be minimum. During the survey 82.9% farmers were don't know the recommended doses only 17.1% respondents answered that they know the proper usage.

Before the National pesticide residue monitoring system in Pakistan there is no such lab and well

knowledge to do regular monitoring 81.2% farmers never analysis their peach for pesticide residual. Only 18.8% respondent's analysis their peach for residual analysis and that was just the students of university to do for his degree. The purpose to know the awareness about MRLs in the farmers our majority respondents i.e. 76.8% were don't know the maximum residue limit and only 23.2% farmers were known to MRLs. On the bases of the primary data we can conclude that farmer must be educated about its limit and should follow the parapet use of pesticide. As the modern world known to hazardous nature of chemical pesticide but during the survey majority of our respondents i.e. 65.2% were unaware about the harmfulness of chemical pesticide. And only 34.8% farmer know it hazardous nature. Different pesticides poisoning symptoms were observed which are presented in [Figure 6](#).



**Figure 5:** Safety measures while using pesticides.



**Figure 6:** Pesticides poisoning symptoms reported by interviewers.

The above study was conducted in Swat Malakand Division where escalating pesticides related activities is among the major environmental problem. The current survey described the knowledge, behavior, practices, and pesticides toxicity symptoms among the field workers in the Swat. The response of interviewers was high which indicates their intentions to facilitate the present study. A well-educated community was reflected as high level of literacy was recorded.

## Survey related to pesticide applications in peach orchards

Awareness about natural and biological control was low which is in consistent to a Netherland study ([Meulenbelt, 1997](#)). These finding also agree with the studies [Iorizzo et al. \(1996\)](#) and [Yassin et al. \(2002\)](#), who have reported that mostly exposure to pesticides occur from skin absorption and through inhalation. This emphasize on the launching of extension programs on pesticide alternatives. Similar studies were reported from other countries ([Cole et al., 1997](#); [Gomes et al., 1998](#)). Majority of farm workers do not wear precautionary measures even then they knew about protective measures ([Sivayoganathan et al., 1995](#); [Perry et al., 2000](#)). Another main problem of the developing countries is non-availability of proper storage ([Saleh et al., 1995](#)). A multi-residue analysis of 30 pesticides in fresh peaches produced in Swat Malakand, Pakistan was conducted. The methodology involved a sample extraction procedure using liquid-liquid partition with acetonitrile followed by a clean-up step based on solid-phase extraction (SPE). Pesticide concentration in real peach samples was compared with the maximum residue levels (MRLs). Pesticide residues were detected in 73% of the peach samples. Most frequent residues were metalaxyl,  $\alpha$ -cypermethrin, azoxystrobin, dimethoate, tebuconazol,  $\lambda$ -cyhalothrin and spiromesifin in peach samples ([Samad et al., 2019](#)). For the eradication of disease vectors and pest control, many fungicides, insecticides and acaricides are being used on crops. Due to mishandling, poor application practices and inadequate management of pesticides in developing countries more poisoning cases are reported ([Bhanti et al., 2004](#)).

## Conclusions and Recommendations

It is concluded that field workers in Swat Malakand, extensively uses pesticides and in spite of their awareness about pesticides effects their protective measures are very poor. Pesticides usage trend is being escalating which leads to be the part of our food cycle. This is harmful for the living organisms. The low level of awareness in the study area and the public health and environmental consequence resulting from the misuse of pesticides is alarming. Proper training is required to handle the pesticides for farmers in peach orchards of Swat, Malakand Division. There should be an integrated effort from governmental and non-governmental organizations that focus on the awareness raising of farmers on proper pesticide management related issues. There should also be

## Author's Contribution

**Shazia Akhtar:** Data analysis and manuscript writing.  
**Abdul Samad:** Sampling and collection of background information on questioner.  
**Afshan Gohar:** Data entry and statistical data analysis in SPSS software.  
**Muhammad Munir Shahid:** Proof reading of the manuscript and helped in resources management.  
**Muhammad Ishtiaq:** Statistical analysis and formatting of the manuscript.  
**Arslan Sarwer:** Retrieve of reference and valuable discussion.  
**Adnan Khan:** Questioner development and its testing.  
**Karam Ahad:** Overall project incharge and conceiving and execution of the study.

## References

- Waichman, A.A., E. Eve and N.C.S. Nina. 2007. Crop Prot. 26: 576e583. <https://doi.org/10.1016/j.cropro.2006.05.011>
- Bush, E.A., K.S. Yoder and A.H. Smith. 2009. Jr. Brown rot on peach and other stone fruits. 2009. Virginia Cooperative Extension. accessed 12/15/2011.
- Cole, D.C., F. Carpio, J. Julian and N. Léon. 1997. Dermatitis in Ecuadorean farm workers. Contact Dermat. 37(1): 1-8. <https://doi.org/10.1111/j.1600-0536.1997.tb00367.x>
- Gomes, J., O. Lloyd, M.D. Revitt and M. Basha. 1998. Morbidity among farm workers in a desert country in relation to long-term exposure to pesticides. Scand. J. Work, Environ. Health. pp. 213-219. <https://doi.org/10.5271/sjweh.301>
- Iorizzo, L., A. Bianchi, G. Gamberini, A. Rubino, M. Missere, G. Minak Jr. and G.B. Raffi. 1996. Assessment of human exposure to pesticides in greenhouses and effectiveness of personal protective devices. Arh. Hig. Rada Toksikol. 47(1): 25-32.
- Iqbal, M. and M. Ahmad. 2005. Science and technology-based agriculture vision of Pakistan and prospects of growth. Proc. 20<sup>th</sup> Annu. Gen. Meet. Pak. Soc. Dev. Econ., Islamabad. Pak. Inst. Dev. Econ. (PIDE), Islamabad, Pakistan.
- Khan, M., T. Rahim, M. Naeem, M.K. Shah, Y. Bakhtiar and M. Tahir. 2008. Post harvest economic losses in peach produce in district Swat. Sarhad J. Agric, 24(4): 705-711.
- Khooharo, A.A. 2008. A study of public and private sector pesticide extension and marketing services for cotton crop. Doctoral dissertation, Sindh Agric. Univ. Tando Jam, Pak.
- Khooharo, A.A., R.A. Memon and M.U. Mallah. 2006. A linear regression model to study the relationship of pesticide imports with. J. Appl. Sci. 6(5): 1209-1213. <https://doi.org/10.3923/jas.2006.1209.1213>
- Bhanti, M., G. Shukla and A. Taneja. 2004. Bull. Environ. Contam. Toxicol. 73: 787e793. <https://doi.org/10.1007/s00128-004-0496-8>
- Meulenbelt, J. 1997. Acute work-related poisoning by pesticides in The Netherlands; a one-year follow-up study. Przegl. lek. 54(10): 665-670.
- Nafees, M., M.R. Jan and H. Khan. 2008. Pesticide use in Swat valley, Pakistan. Mt. Res. Dev. 28(3): 201-205. <https://doi.org/10.1659/mrd.1042>
- Perry, M.J., A. Marbella and P.M. Layde. 2000. Association of pesticide safety knowledge with beliefs and intentions among farm pesticide applicators. J. Occup. Environ. Med., 42(2): 187-193. <https://doi.org/10.1097/00043764-200002000-00017>
- Saleh, A., F. Neiroukh, O. Ayyash and S. Gasteyer. 1995. Pesticide usage in the West Bank. Appl. Res. Inst. Jerusalem (ARIJ), 22.
- Samad, A., S. Akhtar, M.M. Shahid and K. Ahad. 2019. Determination of pesticide residues in peaches by using gas chromatography and mass spectrometric detection. Int. J. Environ. Anal. Chem., 1-13.
- Sivayoganathan, C., S. Gnanachandran, J. Lewis and M. Fernando. 1995. Protective measure use and symptoms among agropesticide applicators in Sri Lanka. Soc. Sci. Med., 40(4): 431-436. [https://doi.org/10.1016/0277-9536\(94\)00143-H](https://doi.org/10.1016/0277-9536(94)00143-H)
- Syed, J.H., A. Alamdar, A. Mohammad, K. Ahad, Z. Shabir, H. Ahmed and I. Ahmad. 2014. Pesticide residues in fruits and vegetables from Pakistan: a review of the occurrence and associated human health risks. Environ. Sci. Poll. Res., 21(23): 13367-13393. <https://doi.org/10.1007/s11356-014-3117-z>
- Yassin, M.M., T.A. Mourad and J.M. Safi. 2002. Knowledge, attitude, practice, and toxicity symptoms associated with pesticide use among farm workers in the Gaza Strip. Occup. Environ.

Med., 59(6): 387-393. <https://doi.org/10.1136/oem.59.6.387>

Zeb, J. and Z. Khan. 2008. Peach marketing in NWFP. Sarhad J. Agric., 24(1): 161.