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A study into determination of pesticide residual effects on environment and farmer's health in Okara Punjab, Pakistan

Rizwan Anjum, Aqeela Saghir, Sohaib Usman*, Hafiz Ali Raza, Hassan Ahmad Khan

Institute of Agriculture Extension and Rural Development, University of Agriculture, Faisalabad, Punjab, Pakistan

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Abstract

The surrounding of the earth is our environment. Environment includes the living and non-living things. From last few decades there is alterations in environment that effects human and the other species on the earth. Pesticides are the chemicals used to control the crop losses by killing the pests harmful for crop. The study deals with environment alteration due to excess use of pesticide and its horrible effects on farmer's health. Objective of the present study is to find out affects about chemical pesticides and to assess the preventive measures they adopt to avoid the pesticide related health hazards. The aim of the present study to find out the perception about the impact of pesticides use on vegetable growing farmer's health in rural areas of tehsil Okara, randomly 4 union councils of tehsil Okara were selected out of which 32 respondents from each tehsil were selected. A sample of 128 respondents selected proportionally. A major proportion i.e. 56.9% of the respondents was agreed that pesticides in vegetables cause illness of farmers. Perceptions of respondents that pesticides cause following diseases to a great extent like increase in headaches (48.5%), fatigue (40.0%), insomnia (45.4%), dizziness (37.7%), hand tremors (42.3%), skin disorders (46.9%), birth defects (36.2%), damage of liver (37.7%), damage of kidney (43.8%), respiratory problems (56.9%) and cancer (36.2%) to some extent, a significant association was found between education, income, pesticides users do not aware of precautionary measures. Pesticides users do not have facilities to save them and Pesticides in vegetables causes their ill health.

***Corresponding Author:** Sohaib Usman ✉ Sohaibusmancheema174@gmail.com

Introduction

Environment is everything surrounding us, everything on the earth has its own environment. According to the ecology and biological science it included all the living and non-living things on the earth even the sunlight. Environment has the holistic effects on the growth and development. It effects the human behavior, cause diseases, mind and the nature of human being. Use of pesticide also disturbed the soil elements and cause soil population (micro *et al.,* 2006; yu *et al.,* 2008). The significance of vegetables in human nourishment is notable. They assume an imperative part in adjusting the eating regimen of a person by giving vitality rich nourishment as well as guarantee supply of crucial defensive supplements like minerals and vitamins, work era, sustenance and money related security of the citizen. (Ensink *et al*., 2014).

A significant enhancement has been observed in the export profit from the horticultural crops during the last years. This section has the enough potential to provide opportunities for farmers to increase income and reduction of poverty and hunger and narrow down social and economic problems of the whole region (Alam and Mujtaba, 2012). In different study it was analysis that different soil toxicity was present in the different areas of the Pakistan like Sialkot, wazirabad, and in some area of Lahore district in Punjab (Khan *et al.,* 2013; Malik *et al.,* 2010).

The use of pesticides started in Pakistan about in 1951-52. It initiated with the introduction of an effective and aerial spraying program on the key crops such as, rice, cotton and sugarcane. Before 1973, imported pesticides were synthesized and standardized by federal Government by the Institute of Plant Protection. At that time, farm chemicals were imported from china and India (Mazari, 2014). Under green revolution modern production technique and productive varieties were introduced. For achieving high yield, the farmers were encouraged to follow mechanized farming system and use farm chemicals.

After that, there is a rising trend in pesticide consumption in Pakistan. Horticultural crops and vegetable sector contribute about 6.1 percent of country's GDP and 23 percent of national food production. Pakistan places at 16th in production of fresh vegetables (FAO, 2015). Excess use of pesticide have many lungs diseased and also effects the growth of the human body (Zarei *et al.,* 2018).

Need for the study

Pesticides use on fruits and vegetables has increased from 20214 M.T in 1998 to 94266 M.T 2015 (GOP, 2015b) which argues about 366% increase in last twenty years. Instead of industrial revolution which leads to decrease in real prices of chemicals, the expense on pesticides use is doubled which increased from Rs.5535 million to Rs.10536 million. Similarly, the use of chemical fertilizer in Pakistan has also enhanced from 1884 to 3581 thousand tons of nitrogen with an addition of 91% during the same time (GOP, 2015c). Above figures show that pesticides use has adverse effects on vegetables, indicating and alarming intensification of chemical use in vegetable production.

In Pakistan the important covered crop is cotton followed by paddy, sugarcane, fruits and vegetables. Almost 80-90 percent of chemicals to control the pests are applied on cotton crop while remaining 10-20% is used on paddy, sugarcane, fruits and vegetables. Pesticides mostly used in Pakistan are insecticides (74%), herbicides (14%), fungicides (9%) acaroid (2%) and fumigants (1%). Province wise Punjab consumes 90% of pesticide due to its vast agricultural fertile land and more awareness among farming society about the toxic chemical use. Although, Sindh has fertile land but the low use of pesticides is due to lack of knowledge among farmers (Khooharo, 2008). The use of pesticide is considerably increased in developing countries where its advantages seem to have not been fully exploited (Dung *et al.,* 2007).

A Study made by the Environmental Society of Agrarians, Pakistan conducted that vegetables are no more a safe source of rich minerals and vitamins because of frequent spraying of toxic pesticides. The majorities of farmers in Pakistan are illiterate or have a low level of education and therefore, they are not following the measure dosages and use such pesticides at any stage of the crop without knowing the negative impact of toxic residues on human health. The pesticide use has implications in multiple dimensions; it affects human health, land productivity, loss of biodiversity and recurring costs of its residues in the food chain. Although the physical condition danger of chemical contact is widely known. This includes infectious disease, unsanitary environments, taxing labour substance abuse and overall poor health (Arcury and Quandt, 1998; Murphy *et al*., 2009; Arcury *et al*., 2000). Pesticide toxicity is generally determined by documenting those symptoms associated with agrochemicals exposure. In addition to low wages, hard duties with long hours and lethargic job, the pickers are also exposed to toxic pesticides sprayed in heavy doses with multiple frequencies on vegetables.

Excess use of pesticide damage the ecological cycle of the species of the surrounding environment. In humans, exposure to pesticides can lead to unspecific adverse health effects that will be referred to here as poisonings. Among the typical symptoms of poisoning in human that are relatively easy to diagnose as acute pesticide poisoning are fatigue, headaches body aches, skin discomfort, skin rashes, poor concentration, feelings of weakness, circulatory problems, dizziness, nausea, vomiting, excessive sweating, panic attacks and cramps etc.

Other studies have revealed a correlation between pesticide use and sarcomas, multiple myelomas, cancer of the prostate, pancreas, lungs, ovaries, breasts, testicles, liver, kidney and intestines as well as brain tumours (Yousaf *et al.,* 2006). Consumption of pesticides in Pakistan has increased in many folds, without significant gains in yield of crops and vegetables. The import of pesticides has increased up to 100 times (Anwar *et al.,* 2005).

The assortment of a model from the populace is usually used in financial side, advertising and other areas because of restrictions of enveloping the total inhabitants (Barnett, 2011: Kinnear and Taylor, 2012). The writers regard it true that the cost is the major restriction to the working objectives of the whole population survey. In a census survey more workers are needed to complete the work, then, the problems of personnel management and supervision will arise. Sampling hypothesis gives a chance to reduce cost and to get appropriate outcomes (Casley and Kumar, 2008).

Materials and methods

Classification of population is the foremost stage regarding to sampling method, segment or element in study, representative element, area or degree of examination, and period for analysis (Kinnear and Taylor, 2012). The segment under examination was vegetable sector for estimating the effect of pesticides on vegetable growing families' health in tehsil Okara which have very fertile land for all the crops including vegetables like cauliflower, potato, onion, tomato and chilies.

Sampling technique

Randomly 4 union councils of tehsil Okara were selected out of which 32 respondents from each tehsil were selected. From each tehsil 1 village was under study. Hence from these union councils 4 villages were taken into account to investigate the health related issues of vegetable growing families and holistic effects of pesticides.

Data collection

The selected villages were subjected to introductory inspection with respect to vegetables farm families. The farming community was classified into two categories which are widely and generally accepted by the researchers, i.e., male and female farmers of vegetables. Qualitative interview schedule was planned to explore demographic attributes of the respondents and their perception about determination of pesticide residual effects on environment and farmer's health in Okara Punjab, Pakistan. Finally, data were analyzed through Statistical Package for Social Sciences (SPSS).

Results and discussion

Table 1 describes the demographic attributes of the respondents according to table respondents were ranging from up to 35 years were half (50.8%), 36-50 years of respondents were (33.6%) and above 50 years of respondents were only (15.6%). According to the Govt. of Pakistan (2015), about 17.22% young population of Pakistan belonged to age group (20-24) and 37.3% population belonged to age group (25-34). 2 depicts that (17.2%) of the respondents were illiterate, and (21.1%) of the respondents were above matriculation. 3 reveals that more than half (55.5%) of the respondents had 12 acres' land. depicts that a large majority (74.2%) of the respondents were owner while (16.4%) of them were owner cum tenant. depicts that (64.8%) of the respondents had up to 10 acres' area under vegetable, while about (26.6%) of them had 11-20 acres. that (14.1%) of the respondents had up to Rs. 1000000 average income per acre, while (74.7%) of them had Rs. 100001 to 200000 average income.

Table 1. Demographic attributes of respondents.

Age (years)	Frequency	Percentage
Young (Up to 35)	65	50.8
Middle (36-50)	43	33.6
Old (Above 50)	20	15.6
Education level		
Illiterate	22	17.2
Primary	27	21.1
Matriculation	52	40.6
Above Matriculation	27	21.1
Size of land holding (acres)		
Small (12)	71	55.5
Medium (12-25)	53	41.4
Large (above 25)	4	3.1
Average yield per acre (in Mounds)		
Up to 200	41	32.0
201 to 300	71	55.5
Above 300	16	12.5
Area under vegetables (Acres)		
Up to 10	83	64.8
11-20	34	26.6
Above 300	16	12.5
Average income per acre (in Rs.)		
Up to 200	41	32.0
201 to 300	71	55.5
Above 300	16	12.5
Total	128	100.0

Table 2. is based on the weighted score computed by multiplying the score value allotted to each category of the scale with the frequency count. The respondents according to their response about the Effects of pesticides on land, air, water, crops and livestock were ranked in this table.

The results given in the table 2. Shows that according to the respondent's response Beneficial microbes of soil are affected was place at 1st position with mean 5.14 among effects of pesticides on land, air, water, crops and livestock. Other effects like Beneficial insects of crops are effected, pH of soil disturbed due

to regular pesticide applications and Quality of milk is disturbed by grazing the pesticide sprayed grasses were given 2nd, 3rd and 4th position with mean value of 4.82, 4.30 and 4.1respectively.and according to that way different positions were assignment to other effects.

Table 2. Ranking of the respondents according to Effects of pesticides on land, air, water, crops and livestock.

Effects of pesticides on land, air, water, crops and livestock	Mean	SD	W.S	Rank order
Beneficial microbes of soil are affected	5.14	1.23	659	1
Beneficial insects of crops are effected	4.82	1.35	618	2
pH of soil disturbed due to regular pesticide applications	4.30	1.31	551	3
Quality of milk is disturbed by grazing the pesticide sprayed grasses	4.1	1.01	531	4
Productivity losses due to over dosage/ negative effect of pesticides on crops	3.94	1.13	505	5
Spray on fodder affecting the animal health	3.94	1.12	505	5
Soil fertility is disturbed	3.86	.86	495	6
Ground water is contaminated due to pesticides	3.74	.88	479	7
Quality and taste of vegetables changed due to spray of pesticides	3.70	.85	474	8
Biological control of harmful pests has also disturbed due to pesticides	3.67	.86	470	9
Fumes of pesticides in air affect the nearby trees, shrubs and crops	3.64	.67	467	10
Air pollution increased due to pesticides	3.56	.76	456	11
Aquatic life is disturbed due to thrown off pesticide bottles in canals and rivers	3.53	.54	452	12

Fig. 1. is based on the weighted score computed by multiplying the score value allotted to each category of the scale with the frequency count. The respondents according the response about the Pesticides attach with were ranked in this table. The results given in the graph 1. shows that according to the respondent's response clothes was placed at 1st position with mean 5.64. Other pesticides which attached mostly like skin, shoes and vehicles were given 2nd, 3rd and 4th position with mean value of 5.56, 5.41 and 5.37 respectively.

Table 3. Ranking of the respondents according to Pesticides uses.

Pesticides uses	Mean	SD	W.S	Rank order
Types	6.07	1.17	778	1
Safety precautions	6.00	1.32	769	2
Potential hazards on health and environment	5.89	1.29	755	3
Level of poisoning	5.80	1.66	743	4

Table 3. is based on the weighted score computed by multiplying the score value allotted to each category of the scale with the frequency count. The respondents according the response about the Pesticides uses were ranked in this table.

The results given in the table 3 shows that according to the respondent's response types were placed at 1st position with mean 6.07. Other uses of pesticides like Safety precautions, Potential hazards on health and environment and Level of poisoning were given 2nd, 3rd and 4th position with mean value of 6.00,5.89 and 5.80 respectively. Table 4 is based on the weighted score computed by multiplying the score value allotted to each category of the scale with the frequency count. The respondents according the response about the Pesticides essential in were ranked in this table.

Table 4. Ranking of the respondents according to Pesticides essential at different stages.

Pesticides essential in	Mean	SD	W.S	Rank order
Harvesting	5.65	1.34	724	1
Sowing	5.55	1.52	711	2
Flowering	5.42	1.62	695	3

Table 5. Association between age of the respondents and their spend of earning on medication in the last year due to pesticide uses.

Age (years)	Spend of earning on medication in the last year due to pesticide uses (in Rs.)			Total
	Up to 1000	1001-2000	above 2000	
Young (Up to 35)	43	17	5	65
	61.4%	44.7%	25.0%	50.8%
Middle (36-50)	18	14	11	43
	25.7%	36.8%	55.0%	33.6%
Old (Above 50)	9	7	4	20
	12.9%	18.4%	20.0%	15.6%
Total	70	38	20	128
	100.0%	100.0%	100.0%	100.0%

Chi-Square =9.373a Significance=.000 Gamma=.345.

The results given in the table 4. showed that according to the respondent's response harvesting was placed at 1st position with mean 5.65. Other essentials of pesticides like sowing and flowering were given 2nd and 3rd position with mean value of 5.55 and 5.42 respectively.

Maumbe and Swinton (2010) estimated that the growers of cotton had lost a mean of Z$ 180 per year in Sanyati and Z$ 316 per year in Chipinge due to pesticide related direct and indirect health cost effects.

Table 6. Association between education of the respondents and their spend of earning on medication in the last year due to pesticide uses.

Education level	Spend of earning on medication in the last year due to pesticide uses (in Rs.)			Total
	Up to 1000	1001-2000	above 2000	
Illiterate	6	8	8	22
	8.6%	21.1%	40.0%	17.2%
Primary	16	6	5	27
	22.9%	15.8%	25.0%	21.1%
Matriculation	31	17	4	52
	44.3%	44.7%	20.0%	40.6%
Above Matriculation	17	7	3	27
	24.3%	18.4%	15.0%	21.1%
Total	70	38	20	128
	100.0%	100.0%	100.0%	100.0%

Chi-Square =13.466a Significance=.000 Gamma=-.296.

The time spent in order to recovering from illnesses credited to pesticides averaged 2 days in Sanyati and 4 days in Chipinge during the growing season years of 1998 and 1999. These estimates only represent the pesticide health cost for lower bounds. Severe pesticide symptoms were dogged in large part by pesticide use practices, especially the lack of protective clothing. Still many small farmers had misunderstanding related pesticide health hazards, and so did little to protect them. Despite of the extension services, 58% small cotton growers in Chipinge and 22% in Sanyati did not know how the mixing of pesticides was becoming a reason for increasing degrees of pesticide toxicity. Farmer training was required in order to achieve better results.

Table 7. Association between size of land holding of the respondents and spend of earning on medication in the last year due to pesticide uses.

Size of land holding (acres)	Spend of earning on medication in the last year due to pesticide uses (in Rs.)			Total
	Up to 1000	1001-2000	above 2000	
Small (12)	38	16	17	71
	54.3%	42.1%	85.0%	55.5%
Medium (12-25)	29	21	3	53
	41.4%	55.3%	15.0%	41.4%
Large (above 25)	3	1	0	4
	4.3%	2.6%	.0%	3.1%
Total	70	38	20	128
	100.0%	100.0%	100.0%	100.0%

Chi-Square =10.472a Significance=.000 Gamma=-.189.

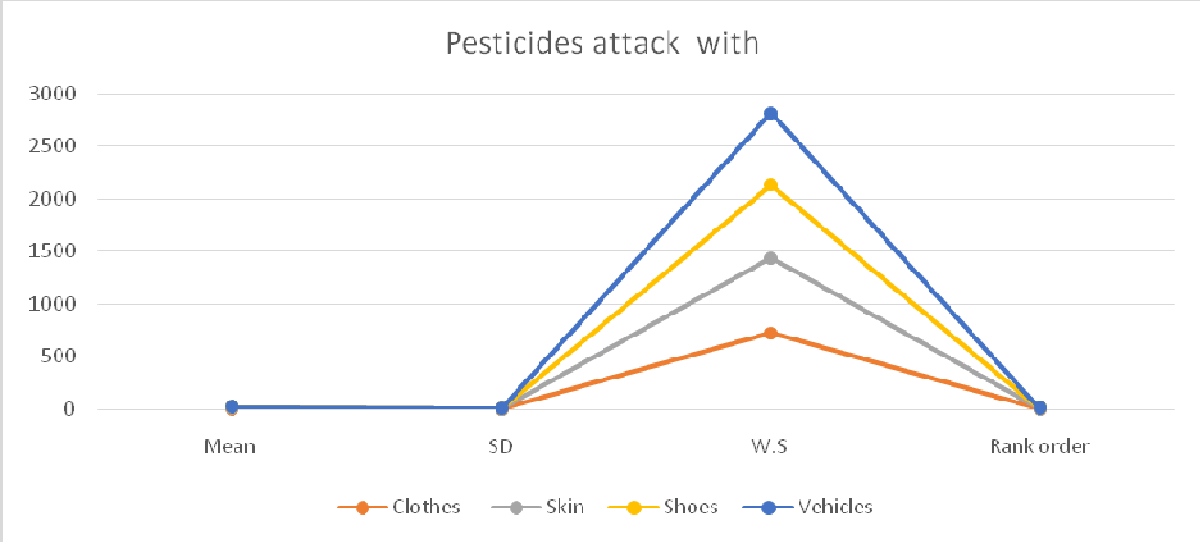

Fig. 1. is based on the weighted score computed by multiplying the score value allotted to each category of the scale with the frequency count. The respondents according the response about the Pesticides attach with were ranked in this table. The results given in the graph 1. shows that according to the respondent's response clothes was placed at 1st position with mean 5.64. Other pesticides which attached mostly like skin, shoes and vehicles were given 2nd, 3rd and 4th position with mean value of 5.56, 5.41 and 5.37 respectively.

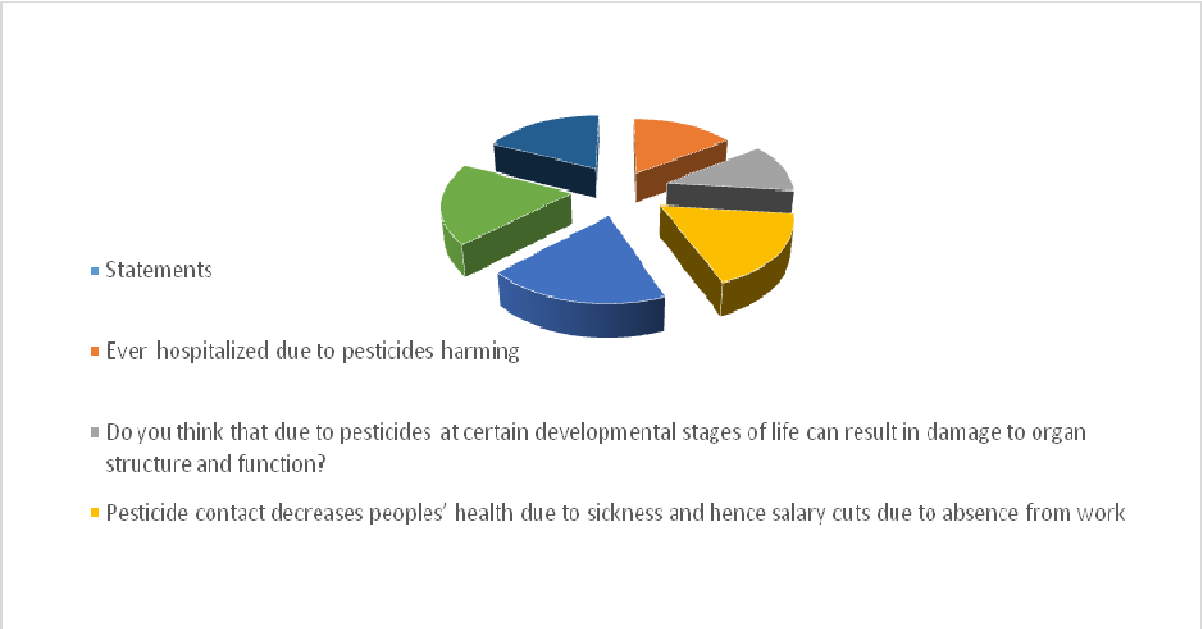

Fig. 2. Distribution of the respondents according to their response about statements.

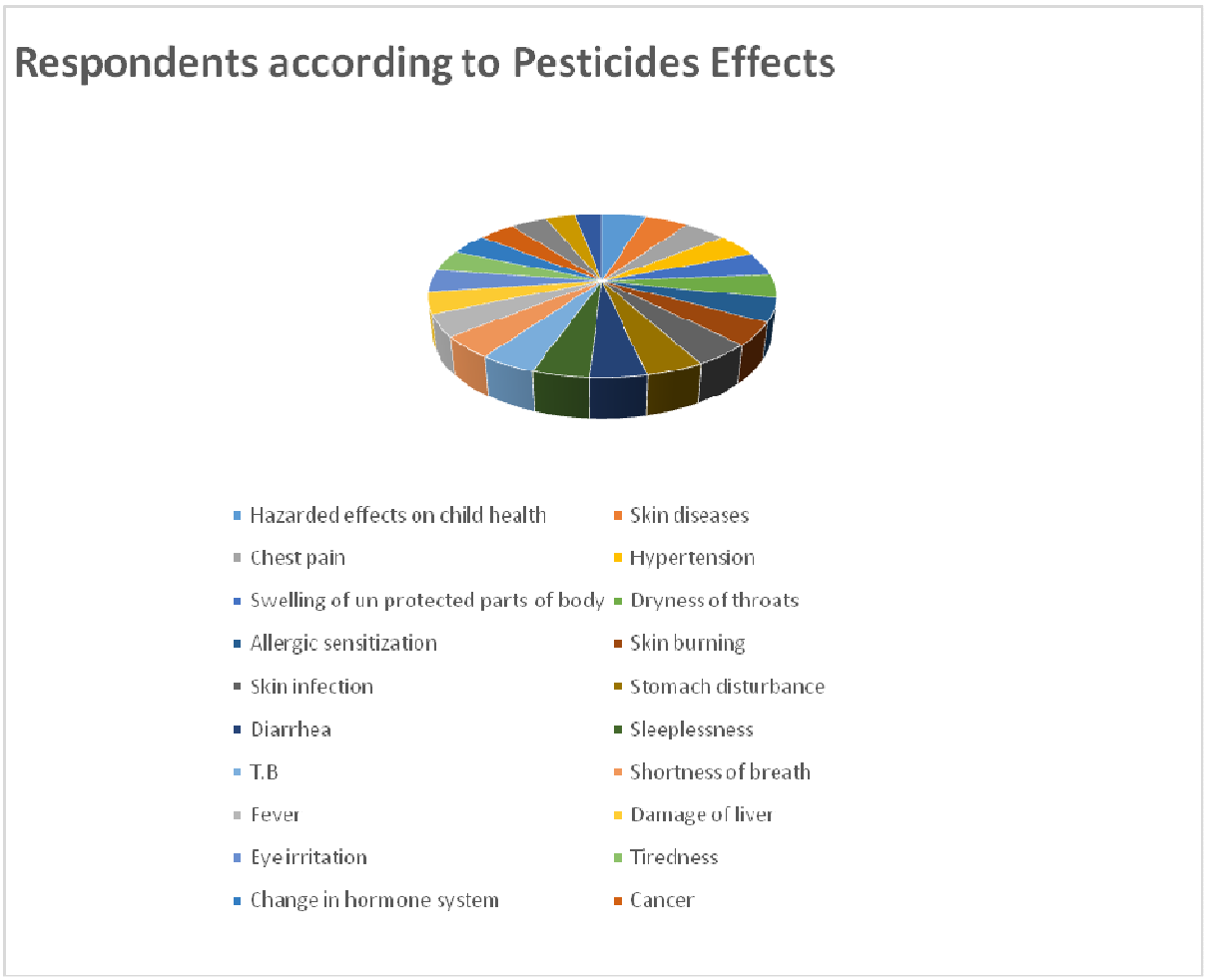

Fig. 3. Ranking of the respondents according to Pesticides Effects.

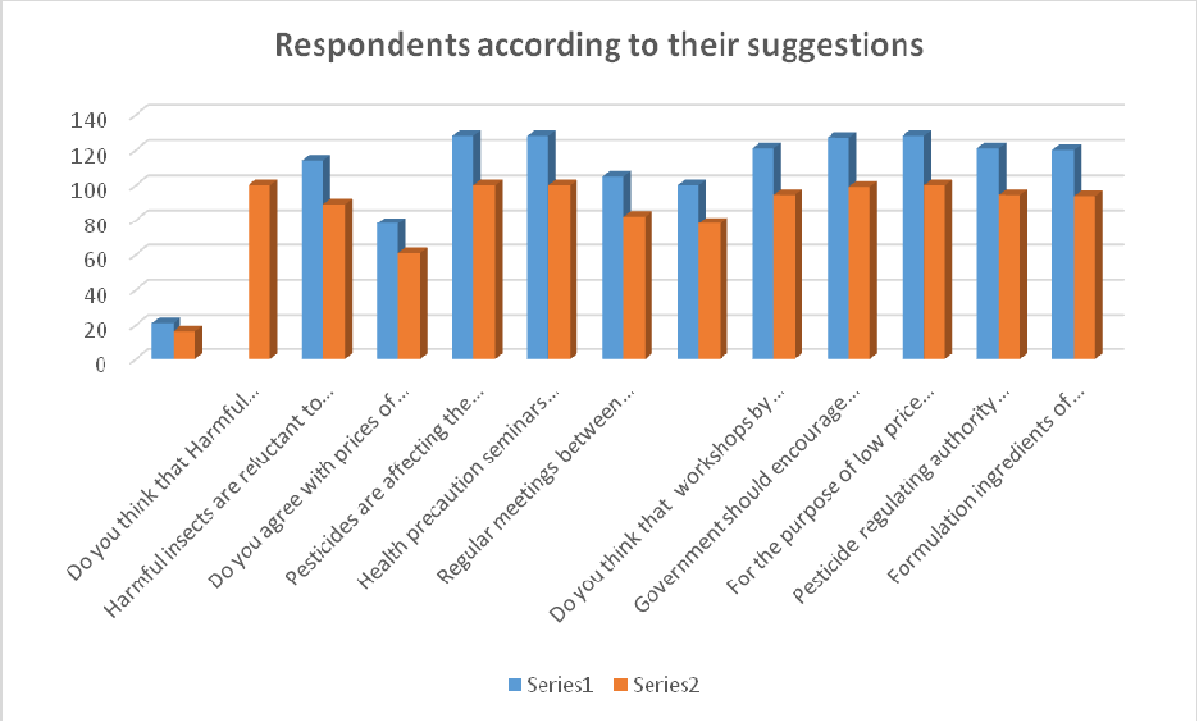

Fig. 4. Distribution of the respondents according to their suggestions.

Indiscriminate and misuse of pesticides has led to tremendous economic losses and hazard to human health. Consumption of pesticides in Pakistan has increased in many folds, without significant gains in yield of crops and vegetables.

The import of pesticides has increased up to 100 times. The detail of import of pesticides indicated that almost every second household has reported pesticides related sickness. In the villages of Pakistan most cases have seen that many households hospitalized due to the nature of acute poisoning. Now pesticides are being used in suicidal deaths at an alarming rate. Most of the farmers and cotton pickers used no cautions such as gloves, shoes and face cover. Women pick vegetables even when they become pregnant or are at the stage of breastfeeding. During the last decade, it is observed that indiscriminate usage of pesticides has created many problems for farmers. High expenditure on pesticides, health hazards, elimination of beneficial insects and harmful insects were developed resultantly through improper pesticides usage. Viewing such a critical situation, the development of integrated pest management technologies is recommended by various agricultural research organizations in Pakistan (Anwar *et al.,* 2005).

Statements

The data shown in fig 2. Reveal that a large majority (79.7%) of the respondents were agree to "every hospitalized due to pesticides harming" while (60.9%) of them were in the favour of "Do you think that due to pesticides at certain developmental stages of life can result in damage to organ structure and function?" (89.8%) of the respondents were agree to "Pesticide contact decreases peoples' health due to sickness and hence salary cuts due to absence from work" while whole majority were in the favor of Traveling cost to hospital due to pesticide illness. And Do you pay Traveling cost to hospital due to pesticide illness?" a huge majority (93.8%) of the respondents were agree to "do you injured in fields due to harmful insects /reptiles?"

The chi-square value (9.373) shows a significant association between age of the respondents and their Spend of earning on medication in the last year due to pesticide uses.

The gamma value shows a positive relationship between the variables. Above table indicates that majority of the middle age respondents had spend more earnings on medication.

The chi-square value (13.466) shows a significant association between education of the respondents and their Spend of earning on medication in the last year due to pesticide uses.

The gamma value shows a negative relationship between the variables. Above table indicates that majority of the illiterate respondents had spend more earnings on medication.

The chi-square value (10.472) shows a significant association between Size of land holding of the respondents and their Spend of earning on medication in the last year due to pesticide uses. The gamma value shows a negative relationship between the variables. Above table indicates that the respondents more land had spend more earnings on medication.

Fig 3. is based on the weighted score computed by multiplying the score value allotted to each category of the scale with the frequency count. The respondents according the response about the Pesticides Effects that affects their health were ranked in this table.

The results given in the graph 2. Shows that according to the respondent's response Hazarded effects on child health was placed at 1st position with mean 6.05 among all other the effects because children are more sensitive and pesticides effects them rapidly. Other effects on health like Skin diseases, Chest pain and Hypertension were given 2nd, 3rd and 4th position with mean value of 5.92, 5.85 and 5.79 respectively. While 5th position was given to the Swelling of un-protected parts of body with mean value 5.75. And Dryness of throats, Allergic sensitization, Skin burning and Skin infection were ranked 6th,7th,8th and 9th position with mean value 5.70,5.64,5.63 and 5.62 respectively.

It is evident from the data presented in fig 4. That (16.4%) of the respondents were in the favor of quality and results of pesticides. All (100.0%) of them were in the favor of Harmful ingredients for health must not be added during formulation. A large majority (89.1%) of the respondents were agree to Harmful insects are reluctant to pesticides, new chemistry of formulation is necessary. (60.9%) of them were satisfied from prices of pesticides. A whole majority (100.0%) of the respondents were in the favor of Pesticides are affecting the biodiversity and aquatic life and Health precaution seminars should be arranged for demonstration. An overwhelming majority (82.0%) of respondents suggested that Regular meetings between farmers and stakeholders should be arranged. (78.1%) of them were agree to the role of pesticides managing policy makers. A large majority (94.5%) and (99.2%) suggested that workshops by the government agencies should be organized for farmers on proper pesticides usage and Government should encourage organic fertilizer instead of chemical fertilizers. A whole majority (100.0%) suggested that for the purpose of low price pesticides, government should encourage preparation, formulation and packing of pesticides in the country. A huge majority (94.5%) and (93.8%) were suggested that Pesticide regulating authority should take steps to reduce the health hazard active ingredients from pesticides and Formulation ingredients of pesticides should be environment friendly.

Conclusion

Pesticides are any substance used to kill, repel, or control certain forms of plant or animal life that are considered to be pests. Pesticides include herbicides for destroying weeds and other unwanted vegetation, insecticides for controlling a wide variety of insects, fungicides used to prevent the growth of molds and mildew, disinfectants for preventing the spread of bacteria, and compounds used to control mice and rats. Regular use of pesticide in vegetables cause ill health of farmers. Although farmers are worrying about the immediate elects in terms of losing days off

work, they view the symptoms as temporary 'mild' poisoning. However, growing evidence that regular exposure to pesticides can lead to chronic impairment of the nervous, immune, reproductive and hormone systems in humans. Children are particularly vulnerable as their organs are still developing. Pakistan is basically an agricultural country; with its economy largely depending upon a good crop especially vegetable and potato yield. Pesticide usage has been undergoing a steady increase in Pakistan, along with the rest of the world. The climatic condition of Pakistan favors pest build up that destroys vegetable crop. The health of the pesticides handlers, farmers and vegetable pickers in particular are at risks due to irrational use of pesticides. Pesticides cause the acute and chronic health effects.

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