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Impact of education/training on the behavior of farmers regarding adoption of safety measures, protective gears, proper handling & disposal of pesticides

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Abstract

Modern Agriculture increased the excessive use of agrochemicals especially pesticides which polluted the environment and become a serious threat to bios/life .The study was conducted in uplands of Balochistan (Quetta, Pishin and Ziarat districts) which are commonly known as fruit basket of Pakistan. It was to assess the education/trainings impact on the farmer's behavior in safe usage of pesticides. Information gathered from 150 farmers of target districts through semi structured face to face interviews and statistically analyzed by SPSS. Findings revealed that education had significant impact the farmers' perception about pesticides usage. Farmers using protectives gears during the pesticides spray (wearing gloves, Spectacles, gum boot, cover mouth/head by cloth and change dress after spray) highly influenced by education level 78%, 56%, and 32%, having education of graduate, secondary and primary respectively. Educated farmers were careful in storage and expiry of pesticides while uneducated farmers stored pesticides in residing rooms/ used expired pesticides. The adoption of safety measures during the spray, such as wind direction, smoking, eating/drinking and cleaning of pesticide equipment was have significant impact of erudite. The trend of burying empty pesticide containers among graduate, secondary and uneducated were 87%, 26%, 11% respectively whereas 56% uneducated and 53% secondary educated farmers thrown empty containers openly on farms and even 33% uneducated farmers used these pesticide containers for domestic utensils. The study depicts that education/trainings played vital role in improving the behavior of farmers regarding safe usage, handling and disposal of pesticides.

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Introduction

Agriculture provides the predominant types of occupation in the world. Almost 50% of the labor in world is employed by agriculture (Das *et al.,* 2011). In Pakistan agriculture sector comprises the largest share of economy and integral part to ensure the food security in the country. Nearly 67% of the population is dependent (directly and indirectly) over agriculture (Pakistan Economic Survey, 2014-15). The foremost threat to agriculture commodities is insect pests and diseases which are the major constraints for the low productivity (Ahmad, 2004). It has been estimated that every year in Pakistan, 15-20% of the total agricultural production is vanished due to the damage of insect pests and diseases (Ahmed, 1980; Yadava and Lal, 1997).

The application of pesticides for pest control has become indispensable for the agriculture production. It does not seem possible to meet the requirements/food of increasing population of the world without the use of these chemicals (Masud and Hassan, 2002). However, the wide spread usage of pesticide contaminated the basic provisions of life i.e. air, water and food (Sharma *et al.,* 2010). The majority of the pesticide associated health and environmental issues are happening due to scarcity of awareness and knowledge, unsafe attitudes, misunderstanding of hazard and insecure practices (Dasgupta *et al.,* 2005; Mahantesh and Singh, 2009).

Overuse and misuse of chemicals is very common among growers of developing countries (Ibitayo, 2006; Wilson and Tisdell, 2001). Unintentional and intentional pesticide poisoning is a major issue in many agricultural societies of middle- and low-income countries. Globally, every year approximately 3 million pesticide poisoning cases occurs which results up to 250,000 mortalities. Out of this death rate a considerable portion belongs to those individuals who commit suicide (WHO, 2006) (4). Pesticides may also responsible for chronic disorders such as birth defects, cancer, immune system disorders and reproductive disorders (Amera and Abate, 2008).

These harmful effects of pesticides are resulted by inappropriate practices of plant protection by growers. The proper knowledge of pesticides toxicity to the farmers and consumers is necessary to prevent the poisoning (Zyoud *et al.*, 2010). Therefore, the present study was performed to assess the impact of education level of the farm workers on the adoption of protection measures during pesticides applications, handling and disposal of pesticides.

Materials and methods

Study Conducted Area

The present study was conducted in three districts viz., Quetta, Pishin and Ziarat which is the major fruits grown area in upland of Balochistan.

Method of study

A semi structured face to face interviews of multistage-cum-random sampling technique was used for the study. A complete list of fruit and vegetable farmers was prepared in the selected district of the area for survey during the year of 22012-13.

Sampling

About 150 fruit and vegetable farmers were randomly selected for interview in target districts using the random sampling method. The selection of respondent farmers from each district was made by proportionate sampling method.

Therefore, 51 from Ziarat, 42 from Quetta and 57 from Pishin were selected. A face to face pre-tested and validated interview procedure adopted ((Tahir *et al.,* 2001) interview was conducted in local languages Pashto/Urdu where needed with iteration and which was further analyzed by statistical package for social sciences (SPSS).

Results

Farmer's literacy rate, adoption of protective gears, trend about pesticides storage, awareness about expiry of pesticides, adoption of safety measures during pesticides application and awareness about safe disposal of empty pesticides containers was assessed during present study

Farmer's literacy rate in area

Education data revealed that more than half (54.7%) of the farmers have up to primary education. Whereas the farmers have secondary and graduate education were 25.3% and 20% respectively. District education data showed that in Pishin, 53% were up to primary while 28% and 19% had secondary and graduate/above education respectively. In district Quetta and Ziarat (in bracket) the farmers having up to primary, secondary and graduate/above were 57% (55%), 19% (27%), and 24% (18%), respectively (Table 1).

Table 1. Literacy rates in the area of farmers/ respondent.

Education	Frequency	%age	Pishin	Quetta	Ziarat
>primary	82	54.7	52.6	57.14	54.9
Secondary	38	25.3	28.1	19.05	27.45
<Graduate	30	20	19.3	23.81	17.65
Total	150				

Farmer's adoption of protective gears

Regardless of education most of farmers neither wear a protective uniform nor follow pesticides protective measures during pesticide application. Nearly, 27.33% of the respondents wear gloves, 24.67% use spectacles, 14.67% wear gum boot, 90% of the farmers cover mouth and nose with piece of cloth during spraying and 80% takes change their clothes following pesticides application (Table 4.5).

Fiendings

Results indicate that farmer having higher education mostly follow protective measures compared to lower education. Farmers with primary and graduate education (in bracket) using gloves, spectacles, gum boot, cover mouth and change dress after spray in samples area were 4.88(83.33), 7.32(66.67), 3.66(40.00), 81.71(100) and 63.20(100), respectively (Table 4.5).

Table 2. Farmer's usage of protective gears/ protective clothing.

Variables of N=150	Respondent			Education Level%age		
	Yes	%age	No	>Primary	Secondary	<Graduate
Wear Gloves	41	27.33	109	4.88	31.58	83.33
Spectacles	37	24.67	113	7.32	28.95	66.67
Gum Boot	22	14.67	128	3.66	18.42	40.00
Cover Mouth/Head cloth	135	90	15	81.71	100.00	100.00
Change dress after Spray	120	80	30	63.41	100.00	100.00
Mean	71	47.33	79	32.20	55.79	78.00

Farmers trend and awareness about pesticides storage and expiry

Overall result shows that farmers having higher education care about storage of pesticides during pesticide spray and handling.

Irrespective of education 20% farmers store pesticides in the sitting/residing room, 47% of the farmers store pesticides in their homes or houses side rooms, while only 33% store them in the farms. Educated people /graduates (80%) store pesticides at farms, while 3% used residing rooms for storage.

In case of farmers having secondary education, 47% and 48% store at farm and side room respectively, while 8% place in residing rooms. Uneducated farmers mostly use side room (47%) and residing room (32%) for pesticide storage.

Overall 50% of the farmers' dame care of expiry of pesticide 30% had no idea of expiry and 20% are spraying the expired pesticides on the crops while 50 either return or burry the obsolete pesticides. Educated trend of pesticide, 80%, 43%, 3%,13%, 77% and 57% had storage at farm, in side room, in residing room, no idea of expiry, return expired pesticide to shops and Burry the expired pesticides respectively.

Lowest class (Primary or less) has diverse trend 10%, 48%, 32%, 33%, 24%, 6% and 4% had storage at farm, in side room, in residing room, no idea of expiry, use expire pesticides, return expired pesticide to shops and Burry the expired pesticides. Whereas, the middle class having secondary education had mixed trend, In case Expiry of pesticide, 37%, 13%, 45%, and 26% had No idea of expiry, use expired, return expired pesticide to shops and Burry the expired pesticides respectively (Fig. 1).

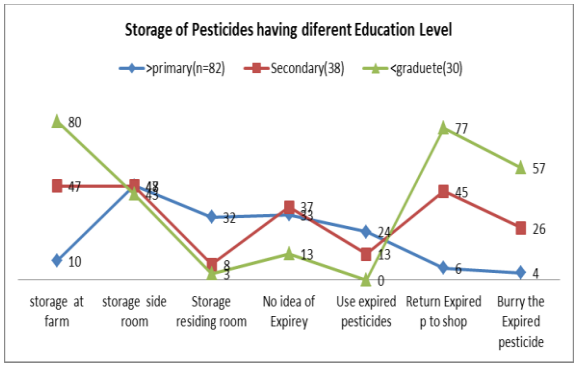

Fig. 1. Storage of pesticides awareness level.

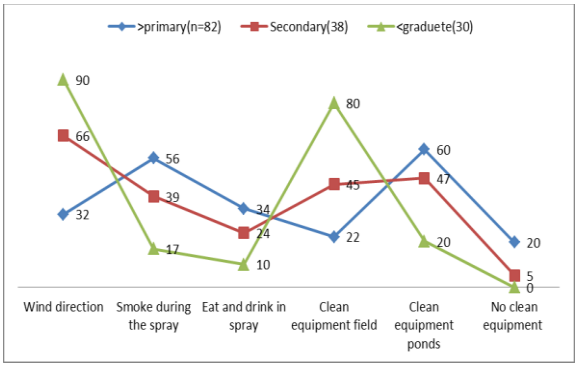

Fig. 2. Farmers adapting safety measures for pesticides.

Farmer's adoption of safety measures during pesticides application

Education had significant effect in adapting safety measures. Results indicate that 52% of farmers avoid pesticides during high wind and also care wind direction during pesticides spray, (90%) of educated graduates and above class care of wind direction while common man up to primary care only 32% of his class.

Smoking data revealed that 66% of the farmers smoke during application of pesticides and 40% eat and drink during the spray.Whereas,17 and 10% of farmers having graduate and above education smoke and drink/eat during pesticides application, respectively, similarly, farmers with primary/illiterate education use smoke (56%) and eat (34%) during spray. While middle class 39% and 24% farmers smoke and eat/drink respectively.

Most of the farmers clean their sprayers/equipment's after spraying, overall 59% clean in field and 12% had not cleaned at all. The most dreadful was the cleaning of their equipment in ponds/running water in which cattle/human commonly drinks. Most educated <graduate/above 80% clean their equipment's in the field and only 20% clean in ponds.

Un-educated farmers 22%, 60%and 20% clean pesticides equipment in field, in ponds and not clean equipment at all respectively. The medium level secondary pass farmers had mix trend 45%, 47%and 5% clean equipment pesticides in field, clean equipment's in ponds and not clean equipment at all respectively (Fig. 2).

Farmers' awareness about safe disposal of empty pesticides containers

Overall 47% of the farmers in the area throw pesticide empty containers away in usual trash, 30% farmer either burry or burn the empty container while 23% farmers admitted that they could use these empty containers for domestic purposes when the size and the shape are affordable for some kinds of uses. The education level has significant about the pesticide's empty containers, educated class 87% believe on burial, no one had used as utensil, whereas secondary/middle level class 21% and 53% used empty container and thrown openly respectively. The uneducated less than primary farmers 33% and 56% used empty container and thrown respectively (Fig. 3).

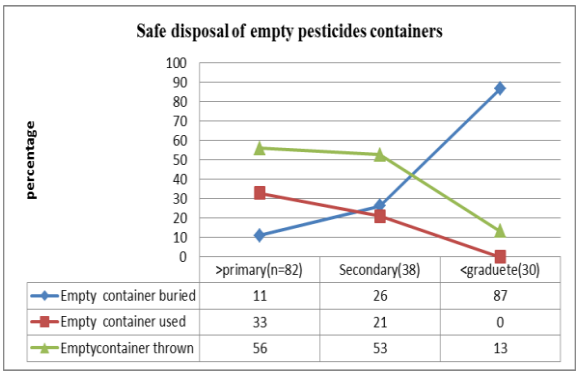

Fig. 3. Empty pesticides container disposal of different educational level.

Discussion

Literacy rate of farmers

Educational level of farmers was observed a best yard for proper usage of pesticide including protective care however the knowledge of safe pesticide use as necessary. The result of this study indicates that 62%

of farmer in the target areas are educated which is like to the 60.2% farmers have education in Nigeria (Abubakar *et al.,* 2015). Another study also in resemblance that more than 60% of the farmers had average level of information regarding plant protection practices (Nagenthirarajah and Thiruchelvam, 2008). It was observed during the survey that female and illiterate populations are vulnerable and ever discouraged by society or unable to express their views about the subject matter. This is like to that women and illiterates were more susceptible to pesticide exposure risks than their men and educated farmers (Sefa *et al.,* 2015).

Farmer's adoption of protective gears

Our results indicate that farmers having higher education follow pesticides protective measure compare to lower education. The non-utilization of protective measure by some farmers having higher education may be due to unavailability of protective clothing's etc. and deficit of information regarding hazardous effects of pesticides. Inadequate personal protection during pesticide handling and applications are a common issue among the growers (Chau *et al.*, 2015). Majority of the farmers do not pay heed to the safety precautions of pesticides during their application (Adeola, 2012; Tandi *et al.,* 2014). Sefa *et al.* (2015) reported that during spraying maneuvers the respondents who completely protect themselves were just 15.6%, while 38% have limited protective clothing and 46.4%, did not wear any protective clothing at all. In other study Banjo *et al.* (2010) found that in Nigeria 86% of farmers did not use any precautionary measures for pesticides due to high cost. The risk of pesticide toxicity to farmers is high when they do not pay attention to the guidelines of pesticide usage and especially when basic safety instructions are ignored regarding protective equipment (Ajayi and Skinnifesi, 2008; Damalas and Eleftherohorinos, 2011).

Farmer's trend and awareness about pesticides expiry and storage

It was noticed that participants with higher education have high knowledge about pesticides storage and expiry. The farmers with low education level didn't care about proper storage of pesticides and even used expire pesticides. Farm operative with proper pesticide knowledge were more motivated to follow guidelines for proper protective actions but inconsistent results were reported by Salameh *et al.* (2004) who stated poor protective measures by farmers having proper knowledge of pesticides handling and application. Whereas Zyoud *et al.* (2010) reported that most Palestinian workers engaged in agriculture activities have low knowledge about pesticides use which attribute to the poor protective actions. Similarly, Mengistie *et al.* (2017) described the use of unsafe and improper storage facilities by farm workers and Chau *et al.* (2015) reported that waste disposal in pesticide handling and application were not found of standard.

Farmers usually accumulate the pesticides in isolated room (80%), animal chambers (5%) and sitting room (1%) (FAO, 2002). The usage of obsolete pesticide in agriculture is a high risk for consumer. Reiler *et al.* (2015) detected 11 pesticides during analyses though numerous of them were obsolete and comprised in the Stockholm convention ratified by Bolivia. The farmers (27%) were used to store pesticides in their bed room in Bangladesh (Abu bakar *et al.,* 2015). The storage of pesticides position in Gaza strip were at home 76% and at farm 24% (Al-Zain and Mosalami, 2014). Reports provide evidence that 50% of the growers use safety measures during spraying. The most frequently used measures are; covering body, avoid drinking and eating during spray, and washing face and hand after spray (Khan *et al.,* 2010).

Farmers adoption of safety measures during pesticides application

Farmer's education level has a vital role in promotion of agriculture and proper practice of agricultural inputs. Low education may have led to farmers' misunderstanding on pesticides hazardous impacts (*Shetty et al.*, 2010). Overall our result showed negative correlation between pesticides precautionary measures and education and positive correlation with pesticides use. Similar results have been reported by Ibitayo (2006) who found that the low level of education can be reason of deficit knowledge about

pesticides. While in other study Yasin *et al.* (2003) found that educated farmers used more sprays than those with little education or uneducated. This disparity may be due to difference in cropping pattern, commodity price and types of pest to be controlled.

It was observed in a pesticide study in Camaroon that 55.5% of farmers during spray did not care about wind direction (pesticide drift) (Tandi *et al.,* 2014). Most of the workers, irrespective of their literacy status drank and ate while working with pesticide. Similar behaviors have been noticed in other part of developing world (Jones *et al.,* 2009). Present work is in agreement with above mentioned studies in case of low education status of the farmers whereas it was noticed that educated farmers take care of wind direction and avoid eating and drinking during pesticide operations.

Farmer's awareness about safe disposal of empty pesticides containers

Mostly it has been witnessed that farmers throw empty bags of pesticides in canals, water channels, or in the courtyard nearby to their houses instead of burying them in the soil. Current study reveals that education significantly affects the behavior of the farmers about safe disposal of pesticides containers. Sometime farmers also use these empty containers for keeping milk, drinking water, or edible oil. These containers may be harmful to infant, may be fatal to wildlife or may pollute the environment (Irshad, 1999). About 59.8% of the farmers dispose of empty pesticide containers after use of chemical spray (Sefa *et al.,* 2015). Mengistie *et al.* (2017) reported that farmers dispose containers unsafely by applying a social practice approach. Mainstream (96.1%) considered as misuse of disposal of the pesticide's bags. About 40-60% of farmers considered the misuse of pesticide containers as domestic purpose usage (Zyoud *et al.*, 2010). Majority 51% burned the dispose of pesticide containers while 46% dispose of pesticides containers in trash (Al-Zain and Mosalami, 2014).

Conclusions

Most agriculture worker in the target area had low education level which attribute to the poor knowledge about using protective gears, pesticide handling, application and disposal. It was observed that farm worker with high education backgrounds were more aware about negative impacts of pesticides and motivated to use proper protection actions when dealing with pesticides, on the other hand uneducated ones are at high risk of pesticide exposure due to lack of awareness about pesticides toxicity. Therefore, it is highly recommended that education programs must be initiated specially about pesticides usage and regarding adoption of proper protection measures during pesticide applications, legislation and implementation is utmost requirement of time in order to decrease the risk of pesticide exposure to farm workers.

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