



## CONSUMER AWARENESS TOWARDS PESTICIDE RESIDUES AND SOURCING PRACTICES: CEREALS AND PULSES

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### Abstract

A random selection of household women was done from rural and urban areas of district Ludhiana (Punjab). The respondents were enquired about their awareness regarding pesticide residues and their sourcing practices related to cereals and pulses and their products. The results of the study revealed that the respondents were having good awareness level regarding pesticide residues, their presence in cereals and pulses, health impacts associated. The statements framed to perceive the knowledge received a score above 3 for both rural and urban respondents indicating good awareness level. Majority of the household women were aware of food safety and were in agreement with the statement that safety from pesticide residues is necessary with mean scores of 3.75 and 4.43 for rural and urban respondents respectively. Sourcing practices of the rural respondents revealed that cereals were mostly home-sourced and none of the respondents outsourced them. Sourcing practices of pulses and its products were found to be quite different from flour in the urban household women of the three income groups. Majority of the cereals and pulses were outsourced by the urban respondents. Also it was found that the urban respondents preferred buying packed food more than their rural counterparts.

**Keywords :** Food Safety, Pesticide residues; Awareness, Food Sourcing Practices

### Introduction

Food is an essential part of our everyday lives. Cereals and pulses are a must in every Indian cuisine. Cereals and pulses have high nutritional value (Hirdyani, 2014; Singh and Bhasin, 2017; Handa *et al.*, 2017; Dhillon and Tanwar, 2018; Chikkara *et al.*, 2019). These are consumed directly and are also used for preparation of various products for people of different age groups (Supriya and Chikara, 2017; Thongram *et al.*, 2016; Tanwar and Dhillon, 2017; Paul *et al.*, 2019; Gupta and Malik, 2017; Sofi *et al.*, 2020 and Handa *et al.*, 2017) These play important role in prevention of oesophageal cancer (Sardana *et al.*, 2018; Kaur *et al.*, 2011). These are affected by several microbes like fungi which reduce their yield (Brar *et al.*, 2019; Haldar and Prakash, 2018). However, several chemical agents like pesticides are used in their production (Miachio *et al.*, 2019). Pesticides are common in India and are considered economically important for high yield production (Prasad *et al.*, 2013; Chauhan and Singla, 2015; Raheja and Kumar 2017). Initially the use of these chemical agents reduced pest attack and paved way for increasing the crop yield as expected (Akhtar *et al.*, 2009; Bhanti and Taneja, 2007; Vijay 2013). Therefore these were readily welcomed by the farmers resulting in an exponential use as years passed by (Bhardwaj 2019; Singh and Gore, 2018; Kumar, 2017).

However, these have grown up into a major concern relating to food safety issues (Sidhu *et al.*, 2019). The illegal use of the insecticide aldicarb on watermelons in California in 1985 resulted in more than 1000 cases of probable or possible human pesticide poisoning (Goldman *et al.*, 1990). Similar poisoning incidents were also observed in India. Developing countries suffer 99% of deaths from pesticide poisoning (Kesavachandran *et al.*, 2009; Swaminathan,

2003). Pesticide use have also been associated with reduced soil fertility (Kaur *et al.*, 2017; Kumar *et al.*, 2014).

The association of pesticides to several diseases over the years has raised consumer concern for safe food (Kumar *et al.*, 2014; Dutta *et al.*, 2018). Consumer habits of buying food as 'when, from where' i.e. sourcing practices are important factors from which their perception can be determined (Sharma, 2011). In India, there had been a few studies regarding consumer awareness on the consumption of safe, pesticide free food (Soodan and Rana, 2019; Pandey *et al.*, 2019). It was concluded in one such study that consumers in India were aware of food safety issues (Sharma and Sangha, 2013). Due to this increased concern, many consumers have started changing their food sourcing practices to organic food consumption (Farhan *et al.*, 2019; Pandey *et al.*, 2019). Considering the importance of the matter, present study was designed to perceive the awareness level of consumers for pesticide residues in cereals and pulses and also their sourcing practices.

### Material and Methods

The present study was undertaken to explore the level of awareness among rural and urban household women and their sourcing practices for cereals and pulses. The study included the survey of 240 household women from Ludhiana district. The sample was divided into 120 rural and 120 urban respondents. Respondents from both the sectors were classified into three income groups namely low income group (LIG), middle income group (MIG) and high income group (HIG) based on the cube-root method.

Data was collected by personally administering the questionnaire to the rural and urban household women regarding their awareness related to pesticide residues, its presence in cereal and pulses, ill- impacts associated;

mitigation strategies and sourcing practices. For determining the awareness level towards food safety from pesticide residues in cereals and pulses, a series of statements were framed. The respondents were asked to respond to the statement ranging from 'Strongly Agree' to 'Strongly Disagree'. For the purpose of analysis, the option 'Strongly Agree' was given the score 5 and 'Strongly Disagree' was assigned the score of 1. Respondents' perception on mitigation strategies that can be adopted and practiced at home to reduce pesticide residues in cereals and pulses was also collected and recorded.

The respondents were also enquired about their sourcing practices for cereal and pulse products. The purchasing behavior was classified into four headers viz. sourcing, branding, form and sector. The sourcing practices included whether the respondents prepared food items at their home or bought them from the market. The respondents were also enquired whether they purchased branded/unbranded food items. They were also enquired about whether they preferred buying products in loose or packed form.

Preferences for organized or unorganized sector were also perceived.

## Results and Discussion

### Awareness of the respondents regarding pesticide residues

Awareness of the respondents regarding pesticide residues is presented in table 1. From the results it can be stated that all the respondents both from rural and urban backgrounds were having good awareness level regarding pesticide residues as they scored above 3 for all the statements. Majority of the respondents knew that pesticides are sprayed on cereals and pulses during their production cycle. However, on this statement the level of knowledge of the rural respondents was higher than their urban counterparts with a mean score of 4.6 and 3.47 for rural and urban respondents respectively. Persistence of pesticides on crop surfaces was also known by the majority of the respondents.

**Table 1:** Awareness of respondents towards pesticide residues in cereal and pulse products

S. No.	Statement	Rural (Mean±SD)	Urban (Mean±SD)
1	Pesticides are sprayed on cereal and pulses during production by the farmers	4.60±0.77	3.47±0.99
2	Pesticides persist on the surface of crops	4.12±0.98	4.04±0.96
3	Pesticides are present as residues in cereal and pulses bought from market	3.69±1.10	3.99±1.14
4	Safety from pesticide residues is necessary	3.75±0.93	4.43±0.84
5	Household processing of cereal and pulse helps in decontamination	4.03±0.81	4.17±0.91
6	Entry of pesticide residues through cereal and pulses may cause multiple health problems	3.79±0.98	4.01±1.00

Here it was noted that the household women were not aware of duration and extent of persistence. It was found that most women believed that pesticides on the surface last for short time and were not aware about long term persistence of the residues. Presence of pesticides as residues in cereal and pulses bought from market was also known by majority of the respondents with a mean score of 3.69 and 3.99 for rural and urban household women respectively. Majority of the household women were aware of food safety and were in agreement with the statement that safety from pesticide residues is necessary with mean scores of 3.75 and 4.43 for rural and urban respondents respectively. The fact that entry of pesticide residues through cereal and pulses may cause multiple health problems was supported by majority of the respondents. In another study it was reported that people were ready to pay premium price for pesticide free produce (Farhan *et al.* 2019, Singh *et al.* 2019) Majority of the respondents believed that simple household processing operations such as washing help in reduction of pesticide residues. The reasons for the perception of the respondents are given in Table 2.

### Sourcing Practices for Cereals and its products

It can be seen from the Table 3 that out of the forty rural respondents in LIG, 57.5 percent used flour from wheat grown in their own fields while 42.5 percent outsourced it. In contrast 90 percent of the women from MIG followed the same pattern of home sourcing of cereals. None of the respondents from the higher income group outsourced cereals. Out of the 42.5 percent respondents from LIG, none of them purchased branded cereals. All of them purchased 'open-unbranded' flour from *Atta-chakkies*. No respondent from LIG purchased branded food item. Only one respondent purchased branded cereals from MIG. Four (10 percent) respondents from the HIG purchased branded dhal from the market. Rest of the respondents who practised outsourcing purchased unbranded items from market and this was the common feature observed among all the three income groups. After asking about the preferences for branded or unbranded food items, the rural women respondents were observed for their choices for the open or packed food items. Almost all the respondents who represented outsourcing behaviour were found to give more preference to buying open food items.

**Table 2:** Perception of household women for statements given in table 1

S. No	Statement	Perception/Reasons for agreement or disagreement with the statement	
		Agreement	Disagreement
1	Pesticides are sprayed on cereal and pulses during production by the farmers	<input checked="" type="checkbox"/> It is a necessity as many pests attack the crop at different stages of life cycle <input checked="" type="checkbox"/> Yield is important	<input checked="" type="checkbox"/> No all farmers spray pesticides <input checked="" type="checkbox"/> We prefer buying organic produce
2	Pesticides persist on the surface of crops	<input checked="" type="checkbox"/> These when sprayed in solutions get stucked to the surface and are not removed easily <input checked="" type="checkbox"/> These are chemical compounds that last for long periods	<input checked="" type="checkbox"/> Pesticides like medicines cure severe infestations and in the process get degrade off <input checked="" type="checkbox"/> Natural factors like rain, wind remove it from the surface
3	Pesticides are present as residues in cereal and pulses bought from market	<input checked="" type="checkbox"/> Pesticide formulations can penetrate the surface and remain as residues	<input checked="" type="checkbox"/> Natural factors like rain, wind remove it from the surface
4	Safety from pesticide residues is necessary	<input checked="" type="checkbox"/> These are harmful chemicals <input checked="" type="checkbox"/> There has been a lot in the newspapers and magazines about the health adversities associated	<input checked="" type="checkbox"/> These are like medicines for plant protection and pose no harm to us <input checked="" type="checkbox"/> We have been using them since long time so have become immune
5	Processing of cereal and pulse helps in decontamination	<input checked="" type="checkbox"/> Surfaces can be cleaned by washing	-

Food sourcing practices of urban household women for cereals were also observed and are represented in Table 3. When food sourcing practices of people in the lower income group for cereals were noted it was found that over 92.5 percent of the respondents outsourced cereals while the rest home sourced it. Out of the 37 women (92.5 percent) who used outsourcing only 10 percent purchased branded cereal flour while the rest (90 percent) bought unbranded cereals from the market. Sixty percent bought open while 42.5 percent bought it in packed form. Only 10 percent individuals bought it from organised sector while majority (82.5) preferred unorganised sector for buying cereals. When sourcing of cereals in respondents of the MIG was observed, it found that only 77.5 percent respondents outsourced wheat flour. Among the respondents who outsourced, 45 percent were found to buy branded cereals while 32.5 percent did not prefer any brand. Again 32.5 percent women used unpacked cereals (open) bought from *atta-chakkies* while 45 percent of

them preferred packed wheat cereals. Forty percent of the respondents preferred buying wheat flour from the unorganised sector while lesser people (37.5 percent) were interested in buying from unorganised sector. All women respondents in the higher income group purchased cereals from the market. Out of which 67.5 percent preferred branded cereals. All of them purchased packed cereals. When buying practices of HIG from organised or unorganised were observed, it was found that the majority (77.5 percent) of women preferred buying cereals from organised sector while only 22.5 percent choose unorganised sector. A similar study conducted in Ludhiana revealed that 77.5 percent of the rural women homesourced cereals, Milk (74.17 percent) and Pickles. Results of her study further stated that outsourcing was practiced for vegetables and fruits. The rural respondents preferred unbranded and open outsourced items (Sharma 2011).

**Table 3:** Consumer purchasing behaviour for cereals/ Sourcing practices of consumers for cereals

Income group		Parameter							
		Sourcing		Branding		Form		Sector	
		Home Sourced	Out Sourced	Branded	Unbranded	Loose	Packed	Organised	Unorganised
LIG	Rural	23 (57.5)	17 (42.5)	-	17 (42.5)	15 (37.5)	2 (5)	-	17 (42.5)
	Urban	3 (7.5)	37 (92.5)	4 (10)	36 (90)	24 (60)	17 (42.5)	4 (10)	33 (82.5)
MIG	Rural	36 (90)	4 (10)	1 (2.5)	3 (7.5)	3 (7.5)	1 (2.5)	-	4 (10)
	Urban	9 (22.5)	31 (77.5)	18 (45)	13 (32.5)	13 (32.5)	18 (45)	16 (40)	15 (37.5)
HIG	Rural	40 (100)	-	-	-	-	-	-	-
	Urban	-	40 (100)	27 (67.5)	13 (32.5)	2 (5)	40 (100)	31 (77.5)	9 (22.5)

**Table 4:** Sourcing practices of pulses and its products

Income group		Parameter							
		Sourcing		Branding		Form		Sector	
		Home Sourced	Out Sourced	Branded	Unbranded	Loose	Packed	Organised	Unorganised
LIG	Rural	8 (20)	17 (42.5)	-	40 (100)	36 (90)	2 (5)	-	40 (100)
	Urban	-	40 (100)	-	40 (100)	37 (92.5)	17 (42.5)	4 (10)	33 (82.5)
MIG	Rural	8 (20)	4 (10)	-	40 (100)	40 (100)	1 (2.5)	-	40 (100)
	Urban	-	40 (100)	-	40 (100)	12 (30)	18 (45)	16 (40)	15 (37.5)
HIG	Rural	40 (100)	-	4 (10)	20 (50)	15 (37.5)	-	-	21 (52.5)
	Urban	-	40 (100)	21 (52.5)	19 (47.5)	-	40 (100)	31 (77.5)	9 (22.5)

\*Figures in parenthesis indicate percentage

### Sourcing Practices for Pulses and its products

Sourcing practices of pulses was also observed in rural household women. As seen from the Table 4, only 20 percent of the forty respondents from LIG and MIG each used home sourced pulses and its products while all 40 respondents (100 percent) from HIG used home sourcing. However, 60 percent of HIG respondents used outsourcing practices also for Pulses and its products and bought it from the market. Unbranded pulses and its products were purchased by 50 percent of the respondents of the higher income group while the ratio was cent percent in case of LIG and MIG. It was observed that 22.5 percent of the respondents from the higher income group bought packed pulses and its products from the market. Packed pulses and its products were also preferred by 10 percent of the total forty respondents from the lower income group. Behaviour pattern of outsourcing for open food items was also observed for the respondents of different income groups. None of the rural women subjects purchased any of the food items from organised sector except for the 7.5 percent respondents from HIG who were observed to buy pulses and its products from organised sector. Similar results were obtained by Sharma and Sangha (Sharma and Sangha, 2013).

Sourcing practices of pulses and its products were found to be quite different from flour in the urban household women of the three income groups. All the respondents were found to outsource unbranded pulses and its products except for the 52.5 percent respondents of the HIG which outsourced branded pulses and its products. As seen in table 4, it was found that 92.5 and 30 percent of the respondents in LIG and MIG respectively bought pulses and its products from the market in open form while the rest bought pulses and its products in closed packets. Among the higher income group all the respondents preferred packed pulses and its products. When asked about the place of purchase, it was seen that majority of the respondents from the HIG (77.5 percent) and MIG (40 percent) preferred buying pulses and its products from organised sector. However, the respondents from LIG (82.5 percent) showed deviation towards unorganised sector.

### Conclusion

The results of the study revealed that the respondents were having good awareness level regarding pesticide residues, their presence in cereals and pulses, health impacts associated. The statements framed to perceive the knowledge received a score above 3 for both rural and urban respondents indicating good awareness level. Majority of the household women were aware of food safety and were in agreement

with the statement that safety from pesticide residues is necessary with mean scores of 3.75 and 4.43 for rural and urban respondents respectively. Sourcing practices of the rural respondents revealed that cereals were mostly home-sourced and none of the respondents outsourced them. Sourcing practices of pulses and its products were found to be quite different from flour in the urban household women of the three income groups. Majority of the cereals and pulses were outsourced by the urban respondents. Also it was found that the urban respondents preferred buying packed food more than their rural counterparts.

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