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# Sensitization Level of Extension Agents and Input Dealers towards Safe Pesticide Practices

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**ABSTRACT**

Recent news of pesticide residues above permitted level in fruits and vegetables vitiated its demand in market due to the mounting concerns of food safety. Consumption of these commodities is vital for nutritional security and for development physically and mentally superior people. Injudicious use of pesticides at farm level is the prime culprit behind enhanced residue levels in agricultural commodities. Due to lack of awareness and other vested interest the farmers are not following the recommended practices, which indeed drain their good health. Their awareness attitude and decision making should be redirected towards more hygienic and healthy pesticide practices. Here comes the role of extension agents and input dealers. Sensitization level of these groups has an important bearing on farmers' practices. Hence this study attempted to measure their sensitization after constructing a scale. The scale was constructed by adopting Likert method of summated rating, pilot tested on forty non-sample respondents and the final statements were selected following t test. The scale was administered to a random sample of 32 input dealers and 40 extension agents from Hapur, Ghaziabad, Faridabad, and Sonepat districts of U.P. and Haryana to measure their sensitization level. The results indicated that more than 90 per cent of extension agents have medium to high sensitization level, while near to 90 per cent of input dealers were falling in low to medium sensitization category. The difference was tested using Mann-Whitney U test and it was found statistically significant at less than five percent level of significance. The results are raising important alarm for taking remedial measures in spur of the movement to make the input dealers more sensitized, for, their sensitization would be reflected in farmers practices of pesticide use.

**Key words:** Extension agents, input dealers, pesticides, sensitization level, Safe pesticide practices.

## INTRODUCTION

Pesticides have been in use for eons by the human beings to protect themselves and their assets from the uninvited invaders, the pests. An overwhelming number of evidences show that pesticides are inevitable to ensure food security, and even with the use of pesticides the crop losses by pests range from 20-40 per cent of agricultural productivity (Oerke 2006, Savary *et al,* 2012,). Nevertheless, with the introduction chemical pesticides and their unwarranted use, particularly in agricultural pest management, pesticides gained the new status of food contaminant, and environmental pollutant. Owing to which, pesticides consumption in food commodities is raising the topical outcries and unending debates since the immediate past. Agencies like EPA, USDA, FSSAI, Food Standard Agency, UK claim that the pesticides in your food are safe for consumption, given it is below maximum residue limits permitted. And several expert committees have specified the recommended MRL levels for each pesticide in each food commodity and they reiterate that presence of a detectible pesticide residue does not mean the residue is at an unsafe level. Moreover, the emphatic organic farming was been reported to be economically viable option in long run and unviable otherwise considering the local adaptation period; and nutritional differences of organic produce with other farming methods were insignificant (Kristiansen 2006, Gaur 2016, Gyarmati 2016). Thus, the movement is regarded with skepticism. Besides, the procedural difficulty and market volatilities curb an average Indian farmer to think of that option. As we entered a stage in which the natural resources are maximum exploited, the ecological balance is well disturbed, environment much polluted and human health best ignored, the urge is to regain the goodness. From the studies above quoted it is apparent that going

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pesticide free is not viable at least to a comparable period of time. Henceforth, the agricultural practices must be redirected to a sustainable production mechanism with limited use of chemical pest control method along with other control measures. There should a paradigm shift from the way the chemical pesticides are handled and consumed to a more prudent manner upholding the safety and quality of farmers and consumers health as well environmental wellbeing.

The role of government agents and input dealers in selection of pesticides, the volume sprayed and frequency of sprays and in other agro-advisory services and diagnostic services are well pronounced in a number of studies. Mostly, the input dealers are the source of agro-chemicals and major source of information to the farming community (Al-Zaidi *et al.,* 2011, Ganiger 2012, Etyang *et al.,* 2014, Saha *et al.,* 2015, Devi *et al.,* 2017). Hence these two groups are important link in ensuring and promoting pesticide safety. They are working at the grass-root level and they hold substantial credibility among the farmers. All these make the public and private advisory service providers a perfect fit for initiating the pesticide safety at farm level. The awareness level of these stakeholders thus has significant implications on farmers' practices and decision making.

It is imperative to gain a deep understanding of sensitization level of extension agents and input dealers towards safe pesticide handling practices. Sensitization of stakeholders to pesticide safety is operationalized as peoples' attempt to make themselves/others aware of and responsive to negative outcomes of pesticides and importance of pesticide safety measures. The concept includes ones' own actions and their advocacy to others for safe pesticide practices. Given the paucity of literatures which have undertaken an extensive research in this scene, the present study attempted to figure out the sensitization level of extension agents and input dealers through constructing a scale. The scale measured present level of sensitization of stakeholders towards pesticide safety. A null hypothesis has been formulated for the study, stating no difference in sensitization level of input dealers and public extension providers.

## METHODOLOGY

### Scale construction

A scale was constructed to measure sensitization level of stakeholders following the method of summated rating suggested by Likert (1932) and Edwards (1957). The important steps adopted for the scale construction were;

**Collection and editing of statements:** A set of potential scales items, which can be rated on a 1-to-5 Disagree-Agree response scale, was created. Creation of items involved the engagement a number of people from the relevant fields of Agricultural Extension, Agricultural Economics, Vegetable Sciences and Entomology Divisions of IARI . For instance, some form of brainstorming was also conducted to create the items. Besides this available literature on pesticide impact and pesticide safety was also referred. The statements were then edited after Edward criteria. The process ended up in generation 56 items.

**Relevancy test** : To examine the statements for their relevancy in measuring the sensitization level of stakeholders towards pesticide safety, the items collected in the first step was subjected for expert scrutiny by a panel of judges from the above mentioned fields. This was accomplished by presenting the statements to thirty experts for relevancy judgement on a five point Likert scale of relevancy viz., most relevant, relevant, neutral, irrelevant, and least relevant with scores 5, 4, 3, 2, and 1, respectively. Now the total relevancy score of each item was calculated by summing the scores of all the thirty judges responses. Afterwards, relevancy percentage, relevancy weightage and mean relevancy scores were worked out for all the 56 statements individually by using the following formulae.

**Relevancy percentage :** Relevancy percentage was worked out by summing up the scores of highly relevant, relevant and neutral categories, which were converted into percentage

**Relevancy weight (RW)**

$$RW = \frac{Number\ \ of\ most\ relevant\ \ response * 5 + Number\ \ of\ relevant\ \ responses * 4}{Maximum\ \ possible\ \ score}.$$

**Mean Relevancy Score (MRS)**

$$MRS = \frac{Number\ of\ most\ relevant\ response * 5 + Number\ of\ relevant\ responses * 4}{Number\ of\ judges}$$

The statements having a relevancy percent above 70, relevancy weightage above 0.70 and mean relevancy score above four were then selected. The total number of statements retained after this relevancy screening process was 36. These statements were further rephrased and edited after judges' remarks.

**Item analysis:** in the next step of scale construction statements retained in the previous procedure was administered to non-sample respondents for pilot testing. They were asked to score the statements on five point continuum *viz.,* strongly agree, agree, undecided,

disagree and strongly disagree with scores of 5, 4, 3, 2 and 1, respectively and a reverse scoring pattern was adopted in negative statements. The score obtained by each respondents was calculated. On the basis of total score, upper and lower 25 per cent of the subjects were selected a criterion group for calculating 't' value. The responses were then summed up for obtaining total score on each item. The critical ratio was calculated by t-test. Items or statements were selected on the basis of higher 't' value over a cutoff point of 1.75.

$$t = \frac{\overline{x}_h - \overline{x}_l}{\sqrt{\frac{s_h^2}{n_h} + \frac{s_l^2}{n_l}}}$$

$\overline{x}_h$ = Mean score of given statement in high group

$\overline{x}_l$ = Mean score of given statement in low group

$s_h^2$ = The variance of the distribution of responses in high group

$s_l^2$ = The variance of the distribution of responses in low group

$n_h$ = number of subjects in high group

$n_l$ = number of subjects in low group

The t test provides information on discrimination capacity of each statements.

**Reliability test:** Reliability of the testing instrument is the ability to give dependable, consistent, stable and accurate measurement score in repeated testing with same instrument. For testing reliability of the scale, total of 40 set of responses were taken in to consideration. The reliability of the scale was measured using Cronbach's Alpha and the reliability coefficient was found to be 0.82 which is satisfactory.

**Validity test:** Validity is the ability of a measuring instrument to measure what it is intended to measure. Validity of the sensitization scale was measured with juries' opinion method.

The final scale to measure sensitization level of stake holders constitutes 17 statements, which is given in Table 1.

**Data collection and analysis**

The study was conducted in National Capital Region (NCR). The locale has been selected purposively since NCR has the largest consumer base (Census, 2011). From NCR two sub-regions, Uttar Pradesh (U.P.) and Haryana were selected purposively. The proposed research locale has been selected intentionally because pesticide consumption in vegetable crops is maximum in U.P. (Indiastat,2012), while the highest number of vegetable samples exceeding Maximum Residue Levels (MRL) of pesticide has been reported from Haryana (DAC&WF, 2014). The study followed stratified sampling procedure. The study was conducted in four districts of Uttar Pradesh and Haryana. The districts were selected purposively, based on detailed analysis of their importance in vegetable cultivation, upon discussion with experts from ICAR-IARI and KVKs. The districts selected for the study were Faridabad, Hapur, Sonepat and Ghaziabad. A random sample comprising 32 input dealers (eight each) and 40 extension professionals (10each) (KVK and State Department of Agriculture) were selected from the study area. Following an interview method, the sensitization scale was administered on these two independent groups. The responses for each statements were recorded on five point agreement-disagreement continuum. The scores can vary in the range of 17 to 85 and a higher score indicates higher sensitization level. The individual responses were then added up to get total score and the scores of two groups were compared and tested using Mann-Whitney U statistics for any difference in their mean.

**Table 1: Final items of sensitization scale**

| Statements | SA | A | N | D | SD |
|---|---|---|---|---|---|
| Pesticides are toxic to non-target organisms | | | | | |
| The indiscriminate use of chemical pesticides degrade environmental health | | | | | |
| I ensure that my clients wash their hands immediately after handling chemical pesticides | | | | | |
| I make sure that my clients read labels carefully before handling pesticides | | | | | |
| I make certain that they keep chemicals away from home premises | | | | | |
| I insist them to look for expiry date before using pesticides | | | | | |
| I urge them to apply pesticides in recommended doses | | | | | |
| I ensure that they wash the sprayers and other equipments immediately after every use | | | | | |
| I consume pesticide safe vegetables | | | | | |
| I recommend my clients to safely dispose left over pesticide solution | | | | | |
| I ask them to wash their face after exposing to pesticides? | | | | | |
| I ask them to use personal protection equipments while handling pesticides | | | | | |
| I inform them about the first aid measures to be adopted incase of poisoning | | | | | |
| I ask them to follow pre-harvest intervals regularly | | | | | |
| I inform them about harmful effects of pesticides on environmental health | | | | | |
| I inform them about harmful effects of pesticides on human health | | | | | |
| I inform them the safe disposal methods of pesticide containers | | | | | |

## RESULTS AND DISCUSSION

The total sensitization score was calculated for each respondents based on their responses to 17 statements of the sensitization scale. Based on sensitization score obtained, the respondents were categorized in to three categories, *viz,* low sensitization level, medium sensitization and high sensitization using median, first and third quartiles (table 2). From the table it can be inferred that 62.5 per cent of extension agents were in medium sensitization category, where as only about 47 per cent of input dealers occupied that category. Near to half of the input dealers exhibited low sensitization level, while the percent of extension agents in this category was only 7.5. The share of input dealers in high category was negligible..

**Table 2: Categorization of respondents based on sensitization level**

| Sensitization level (Scores range) | Respondents | |
|---|---|---|
| | Extension Agents (n=40) | Input dealers (n=32) |
| | *f* (%) | *f* (%) |
| Low sensitization level (<66.25) | 3(7.5) | 13(40.6) |
| Medium (66.25 to 79 ) | 25(62.5) | 15 (46.9) |
| High sensitization level (> 79) | 12(30) | 4 (12.5) |

The sensitization scores of extension agents and input dealers were then compared and the scores were tested using Mann-Whitney U test to find the statistical significance of difference between these groups (table3). It was shown that extension agents were more sensitized towards safe pesticides practices than input dealers.

The difference was found to be statistically significant at $p<0.05$ level of significance (table 4). This could be attributed to their higher educational qualification in agricultural and allied field compared to input dealers who had mainly intermediate level of education. Therefore, the null hypothesis of no significant difference between the respondents was rejected.

**Table 3: Comparison of extension agents and input dealers on sensitization level of safe pesticide practices**

| Groups | N | Mean Rank | Sum of Ranks |
|---|---|---|---|
| Extension agents | 40 | 13.94 | 223.00 |
| Input dealers | 32 | 5.00 | 30.00 |
| Total | 72 | | |

**Table 4: Mann-Whitney U test for extension agents and input dealers on sensitization level of safe pesticide practices**

| Categories | Sensitization |
|---|---|
| Mann-Whitney U | 9.000 |
| Wilcoxon W | 30.000 |
| Z | -2.883 |
| p value | .002 |

The higher level of sensitization demonstrated by extension agents could be due to higher-socioeconomic status. The role of socio-economic variables in pesticide safety was reported by Jallow *et al.* (2017). The higher levels of education, training received in Integrated Pest Management (IPM) and the safe use and handling of pesticides have a positive influence of safe pesticide usage (Jallow *et. al.,* 2017). It was observed from study locale that only a meager number of the input dealers have received any kind of formal training on safe pesticide handling practices. Most of them have a profit motive and they were trying to increase their sales. They were frequently trained by pesticide companies on usage of their new products, the training provided and obtained from any government institution was insignificant. These calls for immediate action to be taken to address this issue because the sensitization level of input dealers have an important effect on farmers. They are the ones' frequently contacted by farmers for any advice and extension agents from government organizations have limited reach to all farmers (Ganiger 2012 and Devi *et al.,* 2017). So sensitization level of input dealers are more important than that of extension agents for promoting safe pesticide practices at farm level.

## CONCLUSION

The role of extension agents and input dealers in ensuring pesticide safety is crucial. They are the link to farmers on advanced technologies and methodologies. Their sensitization level on pesticide safety has a direct influence on farmers' pesticide practices and safety beliefs. Hence a scale has been developed to assess the sensitization level of extension agents and input dealers following Likert method of summated rating. The scale consisted of 17 statements which were then administered to extension agents and input dealers from the study area. The results of which provided evidances that extension agents were more sensitized than input dealers towards safe pesticide practices and the overall sensitization level exhibited by input dealers were not satisfactory. This calls for attention of policy makers and developmental

departments for immediate action since input dealers are the major source of information and advice to farmers than extension agents. If they are not sensitized, how the farmers can be?

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