**Perception of Vegetable Growers on Health Hazards Due to Uses of Pesticide**

**Abstract:**

Vegetables are highly perishable yet nutritionally rich crops that play a significant role in the agricultural economy of India, including the state of Gujarat. This study was conducted in Banaskantha district, a major vegetable-producing region of Gujarat, with a focus on potato and tomato cultivation. A total of 150 respondents were selected through a multi-stage sampling method, comprising 75 potato growers and 75 tomato growers. The study area included three purposively selected talukas, from which five villages per taluka were randomly chosen. In each village, ten farmers (five tomato and five potato growers) were randomly selected. Primary data were collected through personal interviews conducted at farmers' homes and fields. The study aimed to understand key aspects and perception of vegetable farming practices and to provide insights into challenges faced by growers in the region.

**Keywords**: Health, Hazards, Perceptions, Vegetables and Farmers

**Introduction:**

 In India, agriculture contributes approximately 20.19% to the Gross Domestic Product (GDP) and provides employment to about 60% of the country’s workforce (Anonymous, 2020). The country is recognized as the second-largest producer of vegetables globally, accounting for nearly 8.6% of the world’s vegetable output while utilizing only 2% of its total cropped area. During 2020–21, India produced 191.77 million metric tonnes of vegetables across 10.35 million hectares of land, with vegetable exports valued at ₹4969.73 crores (Anonymous, 2020). Vegetable cultivation has emerged as a vital avenue for poverty reduction among smallholder farmers by generating substantial income for both farmers and agricultural laborers. However, the increasing demand and competitive pressure in vegetable production have led many farmers to intensify the use of organophosphate pesticides to maximize yields (Choudhary *et al.,* 2014). Consequently, pesticides have become integral to agro-ecosystems, despite their associated environmental and health concerns (Dey *et al.,* 2013). The excessive and indiscriminate use of pesticides has resulted in several adverse outcomes, including the destruction of beneficial insect populations, the emergence of secondary pest outbreaks, the development of pesticide-resistant pest species, and significant risks to human health (Kumar *et al*. 2024). Given the widespread use of pesticides, it is crucial that vegetable growers possess adequate knowledge of their hazardous effects on the environment, water, soil, and human health (Kumar *et al.* 2024). Understanding farmers’ awareness of pesticide-related hazards is essential for promoting the safe and optimal use of these chemicals. Training programs play a critical role in the dissemination of new technologies and in enhancing farmers’ awareness of health and environmental safety (Kumar *et al.,* 2024). In this study, the term "knowledge" refers to vegetable growers’ awareness and understanding of the risks associated with pesticide use.

**Methodology:**

The present study was conducted in the Banaskantha district of the North Gujarat region, which was selected due to its highest vegetable production area (91,405 hectares) as reported by the Department of Horticulture, Banaskantha. The district comprises fourteen talukas, out of which three were purposively selected based on the extensive cultivation of potato and tomato crops, covering an area of 65,974 hectares. From each of these three talukas, five villages were randomly selected. In each selected village, ten vegetable growers were chosen at random—comprising five tomato growers and five potato growers. Thus, the total sample size consisted of 150 respondents, with 75 each representing tomato and potato cultivators. A structured interview schedule was developed to include all relevant independent and dependent variables. Data were collected through personal interviews, focusing on the respondents’ knowledge about the hazardous effects of pesticides and their opinions on alternative pest control methods. The responses were compiled into a master sheet, and appropriate statistical tools—such as frequency, ranking, arithmetic mean, standard deviation, and weighted mean score—were employed to draw conclusions from the data.

**Result and Discussion:**

**Socio-Economic Profile of Farmers**

The socio-economic profile of the respondents, as presented in Table 1, reveals that a significant proportion (49.33%) belonged to the middle-aged group, consistent with findings by Jhansi and Kalal (2022). In terms of education, 33.33% had attained primary education, followed by 28.67% with secondary education, aligning with the observations of Shinde *et al.* (2021). Landholding patterns indicated that 49.33% of respondents were semi-medium landholders (Chaudhary, 2013; Dhepe, 2014). Income-wise, 47.33% of the respondents reported an annual income of up to ₹50,000. Regarding social participation, 42.67% were members of at least one organization, whereas 25.33% had no organizational affiliation. Farming experience data showed that 54.67% of respondents had a medium level of experience (Rabari, 2006). Participation in extension activities was also moderate, with 56.00% of vegetable growers exhibiting a medium level of involvement (Chaudhary, 2010). Information access revealed that 66.67% had medium sources of agricultural information (Shinde, 2017), and 64.00% demonstrated a medium level of mass media exposure (Chaudhary, 2010; Upadhyay, 2010). Furthermore, 58.00% of respondents showed a medium level of scientific orientation (Choudhary, 2010), while 60.67% exhibited a medium level of risk orientation (Patel et al., 2012).

**Table 1: Distribution of respondents based on socio-economic profile. (n= 150)**

|  |  |  |  |
| --- | --- | --- | --- |
| **S. No.** | **Variable** | **Numbers** | **Per cent** |
| 1. Age
 |
| 1. | Young age group (Up to 35 yr) | 40 | 26.67 |
| 2. | Middle age group (Between 36 to 50 yr)  | 74 | 49.33 |
| 3. | Old age group (Above 50 yr)  | 36 | 24.00 |
| 1. Education
 |
| 4. | Illiterate  | 25 | 16.66 |
| 5. | Primary education (1 st to 8thstd.)  | 50 | 33.33 |
| 6. | Secondary education (9 th to 10thstd.)  | 43 | 28.67 |
| 7. | Higher secondary education (11 th and 12thstd.)  | 19 | 12.67 |
| 8. | Graduation and Post -graduation and above  | 13 | 08.67 |
| C. Land Holding |
| 9. | Marginal (Up to 1.00 ha)  | 30 | 20.00 |
| 10. | Small (1.0 to 2.0 ha)  | 34 | 22.67 |
| 11. | Semi medium (2.0 to 4.0 ha)  | 74 | 49.33 |
| 12. | Medium (4.0 to 10.0 ha)  | 12 | 08.00 |
| 13. | Large (more than 10.0 ha)  | 00 | 00.00 |
| D. Annual Income |
| 14. | Up to Rs. 50000/ -  | 33 | 22.00 |
| 15. | Rs. 50001 to 100000/ -  | 71 | 47.33 |
| 16 | Above Rs. 100001/ -  | 46 | 30.67 |
| E. Social Participation |
| 16 | No membership  | 38 | 25.33 |
| 17 | Membership in one organization  | 64 | 42.67 |
| 18 | Membership in more than one organization  | 34 | 22.67 |
| 19 | Holding position in organization  | 14 | 09.33 |
| F. Farming Experience |
| 20 | Low level of farming experience  | 35 | 23.33 |
| 21 | Medium level of farming experience | 82 | 54.67 |
| 22 | High level of farming experience  | 33 | 22.00 |
| G. Extension Participation |
| 23 | Low extension participation  | 29 | 19.33. |
| 24 | Medium extension participation  | 84 | 56.00 |
| 25 | High extension participation  | 37 | 24.67 |
| H Source of Information |
| 26 | Low source of information  | 22 | 14.66 |
| 27 | Medium source of information  | 100 | 66.67 |
| 28 | High source of information  | 28 | 18.67 |
| 1. Mass Media Exposure
 |
| 29 | Low mass media exposure  | 25 | 16.67 |
| 30 | Medium mass media exposure  | 96 | 64.00 |
| 31 | High mass media exposure  | 29 | 19.33 |
| J. Scientific Orientation |
| 32 | Low scientific orientation  | 29 | 19.33 |
| 33 | Medium scientific orientation  | 87 | 58.00 |
| 34 | High scientific orientation  | 34 | 22.67 |
| K. Risk Orientation |
| 35 | Low risk orientation  | 37 | 24.66 |
| 36 | Medium risk orientation  | 91 | 60.67 |
| 37 | High risk orientation  | 22 | 14.67 |

The distribution of respondents based on their level of perception regarding the hazardous effects of pesticides is presented in Table 2. The findings indicate that a majority (61.33%) of the vegetable growers exhibited a medium level of perception, followed by 22.00% with a low level, and only 16.67% with a high level of perception. The calculated mean score was 10.57, with a standard deviation of 2.48, suggesting a moderate level of awareness among the majority of respondents. These results highlight a significant gap in the high-level understanding of pesticide hazards among vegetable growers in the Banaskantha district. Although most respondents fall in the medium category, the low percentage (16.67%) with a high perception level indicates a need for focused awareness and education programs. Farmers with low perception levels may continue to engage in unsafe pesticide handling and application practices, increasing the risk of health hazards and environmental contamination. The findings are consistent with earlier studies. For instance, Raghunandan *et al.* (2020) and Rohtash (2020) found that a majority of vegetable growers in Karnataka also demonstrated medium levels of awareness regarding pesticide safety. Similarly, Patel et al. (2018) reported that insufficient access to training and extension services significantly contributes to poor knowledge levels among small and marginal farmers.

The high proportion of farmers in the medium category could be attributed to partial exposure to awareness programs through agricultural extension services, media, and local farmer networks. However, the relatively low percentage of respondents with a high level of perception suggests that the existing communication and training strategies may not be entirely effective in delivering comprehensive knowledge on the risks of pesticide use.

This calls for more intensive training and participatory learning approaches, as suggested by Kumari and John (2021), who emphasized the importance of hands-on demonstrations and community-based extension efforts in improving farmers' understanding and practices regarding pesticide use.

**Table 2: Distribution of respondents according to their level of perception about health hazards of pesticides**

|  |  |  |
| --- | --- | --- |
| **S. No.** | **Category** | **Respondents** |
| **Frequency** | **Per cent (%)** |
| 1 | Low level of perception | 33 | 22.00 |
| 2 | Medium level of perception | 92 | 61.33 |
| 3 | High level of perception | 25 | 16.67 |
| Total | 150 | 100.00 |
| Mean=10.57 SD=2.48 |

The study assessed the level of knowledge among vegetable growers on various aspects related to the hazardous effects of pesticide use. Table 3 presents the weighted mean scores (WMS) and ranks based on respondents' responses to five key knowledge areas. The results show that the highest level of awareness was observed in relation to the statement "Do you know about health hazardous effect on human health?" with a WMS of 2.20, securing Rank I. This suggests that the majority of respondents are relatively more aware of the direct risks pesticides pose to human health. Similar findings were reported by Sharma *et al*. (2019), who noted that farmers are more concerned with personal health impacts than environmental or plant-related issues. The statement "Do you know about different plant protection wears to prevent pesticide contamination?" ranked second (WMS = 2.09), indicating a fair level of awareness regarding the use of personal protective equipment (PPE). However, this still reflects the need for improved dissemination of safety practices, as more than a quarter of the respondents reported having no knowledge of protective gear. This is aligned with Gurung *et al.* (2020), who emphasized the limited use of safety gear among smallholder farmers in India due to both lack of awareness and accessibility. Awareness regarding phytotoxicity of pesticides on plants ranked third (WMS = 2.06), which reflects a moderate understanding of how pesticide misuse can harm crops themselves. In contrast, knowledge about the adverse effects of pesticides on soil health (WMS = 1.93) and different diseases caused by pesticide exposure in humans (WMS = 1.70) were comparatively lower, ranked fourth and fifth respectively. These findings are concerning as they reflect a significant knowledge gap, particularly in understanding the indirect and long-term consequences of pesticide use on the environment and public health.

This knowledge disparity may stem from the focus of existing extension activities, which often emphasize immediate crop protection benefits rather than long-term ecological or health impacts. Studies by Patel *et al.* (2018) Kumar *et al.* (2024) and Kumari and John (2021) similarly observed that farmers tend to underestimate the cumulative and chronic effects of pesticides on both soil ecosystems and human health.

The overall low to moderate WMS values across all five indicators highlight the urgent need for enhanced awareness campaigns, with special emphasis on the lesser-known but equally critical areas such as soil health degradation and chronic illnesses caused by pesticide exposure.

**Table 3: Respondents' Knowledge Regarding Harmful Effects of Pesticides**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No** | **Statements** | **Know** | **Somewhat know** | **Don’t know** | **Total Score** | **WMS** | **Rank** |
| 1 |  Do you know about phytotoxicity of pesticide on plant | 43 | 73 | 34 | 309 | 2.06 | III |
| 2 |  Do you know about health hazardous effect on human health | 45 | 90 | 15 | 330 | 2.20 | I |
| 3 | Do you know different disease caused by pesticide in human being | 29 | 47 | 74 | 255 | 1.70 | V |
| 4 |  Do you know about different plant protection wears to prevent pesticide contamination | 42 | 80 | 28 | 314 | 2.09 | II |
| 5 |  Do you know adverse effect of pesticide in soil health | 38 | 64 | 48 | 290 | 1.93 | IV |

**Conclusion:**

The study revealed that the majority of vegetable growers in Banaskantha district possess a medium level of perception regarding the hazardous effects of pesticide use, with a significantly smaller proportion demonstrating high awareness. While farmers showed relatively better knowledge about the direct health hazards of pesticides, their understanding of environmental impacts—such as soil degradation and chronic human diseases—remains limited. This indicates a critical knowledge gap that can hinder the adoption of safe and sustainable pesticide practices. The findings underscore the need for targeted awareness initiatives, capacity-building programs, and improved access to protective equipment. Strengthening extension services with participatory and community-based approaches can enhance farmers’ understanding of both immediate and long-term pesticide hazards, ultimately promoting safer farming practices and environmental stewardship.

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