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# KNOWLEDGE AND PERCEPTIONS OF SMALLHOLDER FARMERS REGARDING *SOLANUM INCANUM L.* USE AS A PESTICIDE IN MKOBA COMMUNITY IN GWERU, ZIMBABWE

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## ABSTRACT

This study explored the knowledge and perceptions the smallholder farmers in Mkoba village hold regarding the use of extracts of the root and fruit of *S. incanum.* A questionnaire was administered to 49 sampled respondents (age range 16 to 70 years) from Mkoba village who practiced communal gardening and used *Solanum incanum* as a pesticide. The data were reported in frequency tables and graphs. The Chi-square was used to determine the associations between the respondents' perceptions and education level, age, and gender at p = .05. An independent t-test was also used to determine whether there was a statistically significant difference between the different educational groups in their perceptions of *S. incanum* at p = .05. Of the 49 respondents, 20(40.8%) were in the age range of 30-50 years, and 30 (61.2%) were female. The study found that respondents were knowledgeable about the *S. incanum* preparations, of which 18 (36.7%) of that indigenous knowledge came from their parents. Many uses of *S. incanum* were reported which included wound healing 23 (46.9%), toothache 32 (65.3%), and stomach-ache 34(69.3%) remedy. There were mixed opinions reported regarding its environmental user-friendliness, health benefits, and efficacy. Twenty-six 26 (53%) of the respondents believed that *S. incanum* was non-poisonous and therefore they did not see the need for any precautional measures including the use of personal protective clothing. The most prevalent symptoms of diseases were skin rash 30 (61.2%), nausea 13 (26.5%), headache 15 (30.6%), and poor vision 8 (16.3%) and these symptoms were common in the age group 30 to 60 years. The popular use of *S. incanum* was attributed to the strong cultural background as well as the unavailability of money to purchase commercial pesticides. Appropriate awareness and education programmes in the community should be organised by the community leaders to increase the level of knowledge to enhance appropriate attitudes and perceptions regarding the hazards *S. incanum* brings as a pesticide.

**Key words:** *Solanum incanum*, knowledge, perceptions, pesticides, poison, health- symptoms, smallholder

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## INTRODUCTION

Pesticides have now become an integral part of modern life and are used to protect agricultural land, stored grain, and flower gardens as well as to eradicate the pests transmitting dangerous infectious diseases. However, the repeated use of pesticides can adversely pollute various components of the water, air, and soil ecosystem [1]. Reports of chronic illnesses due to the use of plant-derived pesticide exposure, particularly in disadvantaged communities are increasing [2], due to a lack of adequate awareness and scientific knowledge about plant pesticides [3]. Exposure to these plant pesticides is closely related to Chronic Obstructive Pulmonary Disease (COPD), cough, shortness of breath, wheezing, asthma, respiratory disease, and high rates of hospitalisation (a measurement of morbidity) [4].

Pesticides are chemical substances used to kill or retard the growth of pests that damage or interfere with the growth of crops, shrubs, trees, timber, and other vegetation desired by humans [4, 5]. Natural pesticide products are available as an alternative to synthetic chemical formulations, but they are not necessarily less toxic to humans [5]. Practically all chemical pesticides are poisons and pose a long-term danger to the environment and humans through their long or short persistence in nature or body tissue [5, 6]. The rampant use of plant crude extracts as pesticides, under the saying, “plant pesticides are better than commercial pesticides” has played confusion in the way human beings handle natural plant pesticides [7]. The confusion is compounded by the farmers’ lack of knowledge, and unintentional or intentional application errors such as handling pesticides carelessly [8, 9].

Some natural plant pesticides are toxic [10]. For instance, rotenone (extracted from the tuber Derris elliptica) is a plant-derived pesticide that has been discovered to be a neurotoxin. It is associated with respiratory ingestion. Although it has a short environmental half-life in the presence of sunlight, an amount between 300 to 500 mg/kg of rotenone is capable of inhibiting substrate oxidation in the $NADH_2$ to NAD system, which is critical for nerve function [10, 11].

The community in Mkoba village, Zimbabwe uses the fruits and roots of *Solanum incanum* L. (*S. incanum*) to control cabbage aphids in their gardens. The cabbage aphids attack *Brassica oleracea var. sabellica* and *Brassica napus* leaves, which are the edible parts of the vegetable, rendering the whole plant useless. Cabbage aphids are small insects that feed by sucking sap from plant leaves [12]. *Solanum incanum* grows in bushes on rocky areas. It bears fruits that become yellow when

ripe. It is the fruit or root which is used by the community to control cabbage aphids. Two hands full of the *S. incanum* fruits are cut into pieces and put in a ten-litre bucket of water for at least a day before the farmer uses the aqueous formulations to control cabbage aphids by spraying the affected *Brassica napus* leaves.

An observation has been made that people in this community handle the *S. incanum* pesticide using bare hands. Sometimes they eat food immediately after spraying without washing their hands thoroughly. The chemicals from the pesticide get into people's bodies through the ingestion of food, inhalation, and the way they handle the pesticide [13]. The lack of evidence-based knowledge about the toxicity of *S. incanum* has resulted in cases of poisoning of the users and the fact that people handle the natural plant pesticide carelessly exacerbates the poisoning.

The purpose of this survey study was to explore the indigenous knowledge and perceptions about *S. incanum* pesticide from the community through questionnaires and to determine the health problems which may be associated with the use of *S. incanum* in Mkoba village. The study focused on the community members who practised vegetable gardening in Mkoba village in the Gweru district of Zimbabwe. One of the most significant agricultural practices utilised to produce vegetables to complement food in the village is community vegetable gardening. Many community garden producers who grow a range of vegetables to boost their food reserves utilise locally sourced pesticides like *S. incanum*. Thus, the response and attitude of the community garden owners are critical to understanding the trend in indigenous pesticide use and awareness in Zimbabwe.

The survey questionnaire had five parts, namely, the demographic profile of the respondents, methods of applying pesticides, use of safety measures while applying pesticides, health profile, and perception of the environmental effects of pesticide usage. The questionnaire was translated into Shona by an expert translator for the participants who preferred it in the local Shona language. The systematic approach was utilised to select respondents from a population of 120 community members who owned and used *S. incanum* pesticide in this village. Descriptive and inferential statistics that included the Chi-square and an independent t-test were used to analyse the data.

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## MATERIALS AND METHODS

### Area of study

The area of study was Mkoba Village, a peri-urban area located in the Gweru district of the Midlands Province of Zimbabwe (Figure 1). Midlands Province has an average population of 1650000 people and 5% of this population is in the Gweru district [14]. Gweru is the main city in the province and is located at latitude -19.4500008 and longitude 29.8166695. In the southern hemisphere, the Gweru district comprises the peri-urban areas surrounding the city [14].

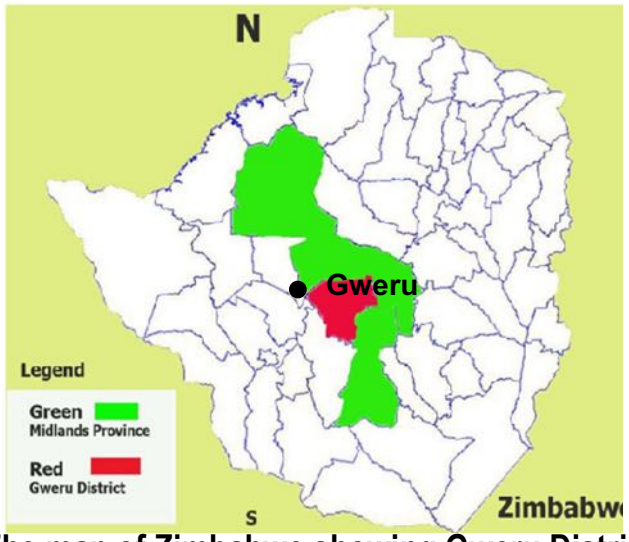


**Figure 1: The map of Zimbabwe showing Gweru District [15]**

### Population and Sampling

The target population was the community members in Mkoba village who owned and used *S. incanum* as a pesticide in controlling pests in their gardens. The village has a population of about 120 community members (villagers) who own and practice communal gardening in the village. A systematic sampling technique whereby every 2nd community member who came to attend to his/her garden was then selected, according to the given frame until the sample was composed of fifty-seven (57) respondents.

$$k^{th} = \frac{N}{n+1}$$

where k, is the sampling interval, n is the sample size, and N is the population size.

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## Methods

A quantitative approach within a descriptive survey was conducted on the inhabitants of Mkoba village of Gweru district using an open-ended questionnaire. Content and construct validity were done by an agricultural specialist reviewer who advised on which questions and items to remove or add. Questionnaires were personally distributed by the researcher to the respondents in the garden. To improve validity several constructs from different sources were used in designing the questionnaire.

## Data analysis

Descriptive statistics which included frequency distribution tables, central tendency, and inferential statistics that included the Chi-square (to determine an association between respondents' perceptions about *S. incanum* and age, gender, and education level) and an independent t-test (for the determination if there was a statistically significant difference between the different educational level, gender, and age to their perceptions about *S. incanum*).

# RESULTS AND DISCUSSION

## Demographical data

Fifty-seven (57) questionnaires were distributed at the garden site to the community members who practised community gardens. Forty-nine (49) respondents were able to return completed questionnaires, therefore eight (8) incomplete questionnaires were discarded. In Table 1, the gender, marital status, age, and family size distribution of the sample are reported. The age distribution of the respondents ranged from 16 to 70 years and the age group 30-50 made up 37% of the total number of respondents. Out of the 40 respondents in this age group, 60% were females and 40% were males. Married respondents were 20 (40%), widowed 4 (6%), single 9 (18%), and divorced 15 (30%). As reported in Table 1, at least 53% of the respondent had done up to the secondary level and 47% tertiary level of education. The size of the families of those who participated in the study ranged from 1 to 9 (Mean = 6.13; SD = 4.39) and the most common family size range of 4-6 constituted 62% of the total number of respondents.

## Information regarding vegetables grown in the community

The most common type of vegetables grown by the community was *Brassica napus* mentioned by (86%) of the respondents and *Brassica oleracea var. sabellica* mentioned by (69%). Most of the farmers grew at least three or four varieties of vegetables (Mean = 3.22; SD = 1.03). The study confirmed that *Brassica napus* was the most grown vegetable in the village mentioned by all the

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respondents and the most attacked vegetable by the cabbage aphids as well. *Brassica napus* is the staple relish in Zimbabwe. According to Nyirenda *et al*. [16], the most common vegetables in Zambia are mustard (35%), rape (31%), tomato (13%), Chinese cabbage (8%), and cabbage (6%). It is reported also that the most valuable vegetables were tomato, rape, and cabbage, with about 38%, 23%, and 12% share of the total value of sales, respectively. The respondents mentioned that the vegetables were attacked by pests such as cabbage aphids, red spiders, birds, and locusts which led them to use fruit or root formulations as the pesticide. The use of the indigenous plant pesticide (fruit or root of *S. incanum*) as a pesticide was mentioned by most of the respondents 39 (80%).

**The Knowledge about *S. incanum* (Nhundurwa)**

In Figure 2, the frequency distribution of the uses of *S. incanum* fruit and root is reported. Besides being used as a pesticide, *S. incanum* is reported to have a variety of uses in the community which included wound healing, curing ear infections, toothaches, and stomach-aches as indicated in Figure 2.

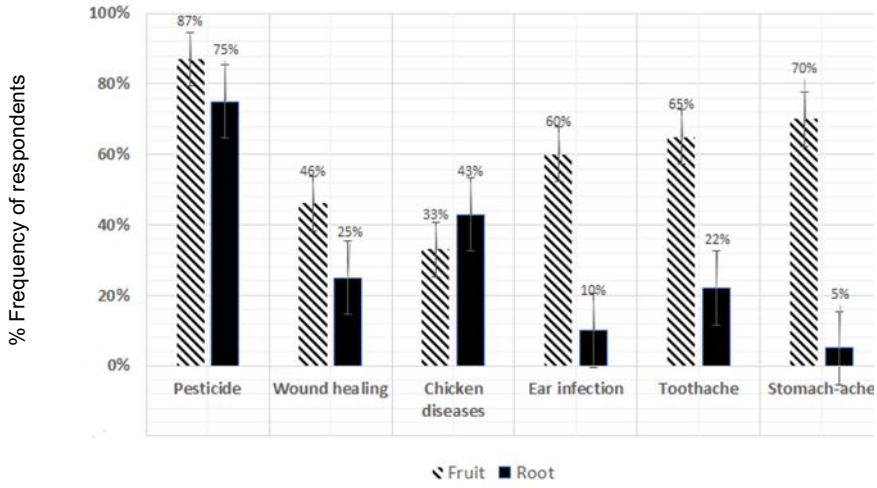


**Figure 2: The frequency distribution of the uses of *S. incanum* fruit and root**

Diverse ethnomedicinal uses of *S. incanum* were reported. These findings were consistent with the results in the previous studies in which the ethnopharmacological studies of *S. incanum* were investigated. For instance, in Uganda, *S. incanum* is mixed with fresh milk to make it curdle faster [17, 18, 19]. In Ethiopia and Tanzania, it is used for curing headaches and muscle pain [20]. In South Africa, the fruit is used as a remedy for toothache and stomach-ache [21].

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**Practices related to *S. incanum***

Most of the respondents 35 (74%) reported that they obtained the fruits and the roots of *S. incanum* from the bushes around the villages. The knowledge and information on how to prepare the formulation came from parents, friends, grannies, and neighbours.

**Perceptions regarding Nhundurwa formulation**

Item 20 sought the respondents' opinion on whether *S. incanum* causes some health problems in the community. Out of the 49 respondents, 26 (53%) of them said that *S. incanum* had no health issues whilst 17 (34%) reported that *S. incanum* was a health hazard in the community. Twenty (20) of the respondents (41%) claimed that the formulations quickly decompose to safe chemicals after a while, and 11 (23%) mentioned that *S. incanum* contained poisonous chemicals which affected the community. Fifty-one percent of the respondents reported that S incanum had no environmental issues.

As reported in Table 3, 28 (57%) respondents reported that using *S. incanum* was a waste of time because the cabbage aphids kept on resurfacing after a short of time after spraying. In item Q24.2, 24 (49%) respondents reported that *S. incanum* has helped the community to control cabbage aphids, in item Q24.3, 6 (33%) respondents reported that *S. incanum* was poisonous, in item Q24.4, 18 (39%) thought that *S. incanum* was creating health problems in the community; in item Q24.5, 27 (55%) respondents agreed that the use of *S. incanum* as a pesticide is helping them to save money and in item Q24.6, 29 (59%) respondents reported that the *S. incanum* formulation was effective on killing the cabbage aphids.
An independent t-test was conducted to determine whether there was a statistically significant difference between the means in the tertiary and the primary/secondary level of education groups regarding *S. incanum's* health perceptions at $p < .05$ (Table 3). Statistically, there was no significant difference between the primary/secondary group (M=3.30; SD= 0.84) and the tertiary education group (M = 2.94; SD = 0.70); [t(1.51), p = .138 >.05]. These results suggest that the environmental and health impact perceptions were not influenced by the education level of the respondents.

Statistically, there was no significant difference in means between the primary/secondary group (M = 3.99; SD = 0.68) and the tertiary education group (M = 4.13; SD = 0.50); [t(0.72), p = .476 >.05] These results suggest that education level does not influence the respondent's perceptions of the efficacy of *S. incanum*.

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**Perceptions related to safety practices**

The frequency distribution of the respondents regarding personal protective clothing (PPC) is reported in Table 4. As reported in Table 4, 33(67%) of the respondents did not use PPCs whilst 16(33%) used PPCs. A Chi-square was conducted to determine if the use of PPC was associated with the level of education of the respondents at $p<0.05$. There was no association between education level and use of PPC, $\chi^2$ (*df.* = 1, N = 49) = 1.41; p = .235. Out of the 33 (67.3%) of the respondents who did not use PPC, 19 (57%) could not afford the PPC whilst others stuck to their perception that *S. incanum* was not poisonous therefore there was no need for PPCs.

As reported in Table 5, the popular method was broadcasting with a frequency of 28 (57%). Very few mentioned the use of aerosol or nozzle spray methods with frequencies of 9 (18%) and 6 (12%) respectively. Most of the respondents, 12 (43%) mentioned that the broom method was easier to use, 3 (50%) of the six who mentioned the nozzle spray said it because it was available at home, and those who reported the use of the spongy 2 (33.3%) mentioned that it was the only item available to use at home. The respondents reported that they saw the effects of the formulation after two days of spraying.

**Health symptoms related to the use of *S. incanum* fruit and root formulation**

As reported in Figure 3, out of the 49 respondents, at least 40 (82%) between the ages of 30-60 years reported skin irritation symptoms, 7 (36.8%) of the age group above 60 reported poor vision, and for the 31–50-year age group, 16 (80%) mentioned nausea as the most common symptom in the community.

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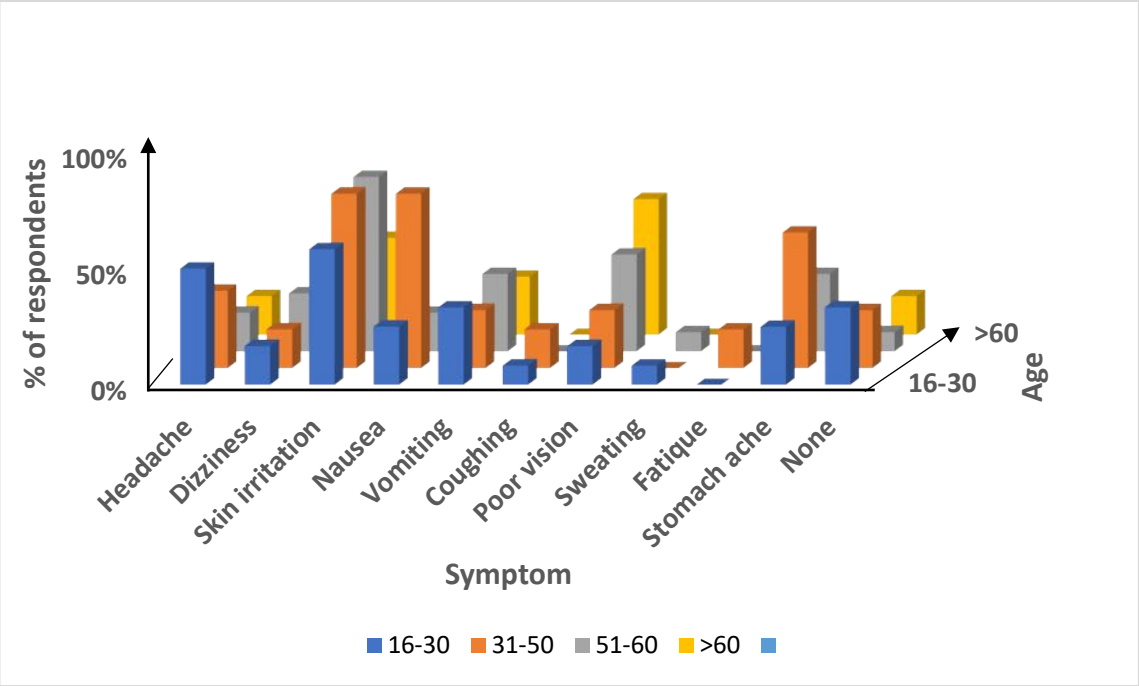


**Figure 3: Symptoms of diseases commonly experienced by the community as they use *S. incanum* pesticide (N = 49)**

A Chi-square was used to determine if there was an association between the prevalence of the symptoms of diseases and age (Table 6). There was no association between age and the symptoms cited by the community except for nausea $\chi^2$ (*df* = 1, N = 46) = 5.02; p = .025; V = 0.33 Medium and poor vision $\chi^2$ (*df* = 1, N = 46) = 8.52; p = .004; V = 0.43 Medium where females were more prone to nausea and poor vision than males.

A Chi-square was used to determine if there was an association between the prevalence of the symptoms of diseases and gender at $p < .05$ according to the respondents' opinions. There was no association between gender and the symptoms in the sited symptoms in the community except for vomiting $\chi^2$(*df* = 1, N = 46) = 5.15; p = .023; V = 0.33 Medium and poor vision $\chi^2$ (*df* = 1), N = 46) = 6.81; p = .009; V = 0.38 Medium (Table 7) where females were more prone to vomiting and poor vision than males [22] who investigated farmers' knowledge and perceptions regarding the effect of plant pesticides. The results from the survey revealed that 29 (59.1%) of the farmers experienced itchy skin, 14 (30.0%) of them had a headache, 2 (4%) of them experienced excessive sweating, and 16 (32.7%) of them vomited. Abang *et al*. [23], used a cross-sectional survey in Cameroon to find out the type of symptoms experienced by smallholder farmers who practiced market gardens and were using commercial pesticides. They reported similar symptoms as reported in this study. The farmers mentioned irritation in the eyes

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and face, dizziness, chest pain, skin irritation, headache, abdominal pain, and fever as common symptoms of diseases amongst the farmers [23].

Several studies found that plant compounds derived from crude extracts that are potent in pest control, such as nicotine and rotenone, have a relatively high acute mammalian toxicity [24]. However, in practice, the acute human health risk of these compounds, as used in pest control, is mitigated by the low concentrations of the active substances typically used in crude preparations. For example, the oral lethal dose of rotenone is reported to be between 300 and 500 mg/kg in humans [25, 26]. The maximum concentration of rotenoids in *Tephrosia* dry leaf is reported to be around 0.1 % by weight [27]. Therefore, a 70 kg person would need to consume more than 20 kg of dry *Tephrosia* leaf material to get a lethal dose [28]. Several phytochemical studies have stated that Solanum species possess glycoalkaloids. Glycoalkaloids levels above 14 mg/100 g result in bitterness while varieties having more than 20 mg/100 g led to a burning sensation in the throat and mouth [29].

## CONCLUSION

In conclusion, the study enabled the evaluation of the indigenous knowledge and perceptions of the community regarding the pesticide properties of *S. incanum* exposure. Mixed feelings about *S. incanum*'s environmental, health, and efficacy were reported. Many symptoms (headache, stomach-ache, nausea, poor vision, skin rash, vomiting, and coughing) linked to the use of *S. incanum* were reported. Understanding farmers' level of knowledge and practices regarding the use of *S. incanum* was vital as a first step to limiting the health and environmental hazards it may pose. The community lacks a mechanism for measuring accurate doses when using fruit and root as the pesticide and there is a need for scientific research to establish the effectiveness and efficacy of *S. incanum*.

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**Table 1: Percentage of respondents according to gender, age, education level, marital status, and the number of households**

| Gender | N | Age | | | | Education | | Marital status | | | | Family Size | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 16-30 | 31-50 | 51-60 | >60 | 1º & 2º | T | M | S | D | W | 1-3 | 4-6 | 7-9 |
| Male (N) | 19 | 4 | 8 | 3 | 4 | 8 | 11 | 13 | 4 | 1 | 1 | 1 | 14 | 4 |
| (%) | (39) | (8) | (16) | (6) | (8) | (16) | (22) | (26) | (8) | (2) | (2) | (2) | (28) | (8) |
| Female N) | 30 | 6 | 12 | 8 | 4 | 18 | 12 | 7 | 5 | 14 | 3 | 5 | 16 | 9 |
| (%) | (61) | (12) | (24) | (16) | (8) | (36) | (24) | (14) | (10) | (27) | (6) | (12) | (33) | (18) |
| Total | 49 | 10 | 20 | 11 | 8 | 26 | 23 | 20 | 9 | 15 | 4 | 6 | 31 | 13 |
| (%) | 100 | (20) | (40) | (22) | (18) | (53) | (47) | (40) | (18) | (30) | (6) | (14) | (62) | (26) |

**1º** – Primary; **2º** – Secondary; **3º** – Tertiary; **M** – married; **S** – single; **D** – divorced; **W** – widowed
*Percentage calculated using the total number of the respondents

**Table 2: Frequency distributions: Perceptions regarding *S. incanum* formulation – Q24 items (N = 49)**

| No. | Item | Responses | | | | |
|---|---|---|---|---|---|---|
| | | Don't Know N(%) | Not At All N(%) | A Little N(%) | Much N(%) | Very Much N(%) |
| 24.1 | The community wastes time in applying S. incanum, it does not work on the vegetables | 28(57%) | 19(39%) | 2(4%) | 0(0%) | 0(0%) |
| 24.2 | The use of *S. incanum* as a pesticide has helped the community to produce vegetables in abundance | 0(0%) | 5(10%) | 3(6%) | 17(35%) | 24(49%) |
| 24.3 | *S. incanum* is poisonous | 8(16%) | 4(8%) | 16(33%) | 13(27%) | 8(16%) |
| 24.4 | The use of *S. incanum* as a pesticide has created health problems in the community | 8(16%) | 2(4%) | 16(33%) | 19(39%) | 4(8%) |
| 24.5 | The use of *S. incanum* as a pesticide has helped the community to save money, which they could have used to buy pesticides in shops. | 10(20%) | 2(4%) | 1(2%) | 9(18%) | 27(55%) |
| 24.6 | *S. incanum* kills the aphids | 0(0%) | 0(0%) | 5(10%) | 29(59%) | 15(31%) |

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**Table 3: Tests of Independence: PNF Factors by Education Level**

| Variable | Education level | N | Mean | S.D. | Difference | t | p | Cohen's d |
|---|---|---|---|---|---|---|---|---|
| PNF- NEH | Primary-Secondary | 31 | 3.30 | 0.84 | 0.35 | 1.51 | .138 | 0.45 |
| | Tertiary | 18 | 2.94 | 0.70 | | | | Small |
| PNF- Eff | Primary-Secondary | 31 | 3.99 | 0.68 | -0.13 | -0.72 | .476 | 0.21 |
| | Tertiary | 18 | 4.13 | 0.50 | | | | Small |

**Table 4: Frequency distribution - special clothes used when working with *S. incanum* and suggested forms of PPCs (N = 47)**

| | | Special clothes used when working with Nhundurwa - More about | | | | |
|---|---|---|---|---|---|---|
| | Frequency N (%) | It's not poisonous N (%) | Old clothes used N (%) | Overalls and gloves N (%) | Can't afford PPC N (%) | Total N (%) |
| Yes | 16(33%) | 0(0%) | 10(63%) | 3(9%) | 3(9%) | 16(100%) |
| No | 33(67%) | 14(42%) | 0(0%) | 0(0%) | 19(57%) | 33(100%) |
| Total | 49(100%) | 14(29%) | 11(22%) | 4(8%) | 20(41%) | 49(100%) |

**Table 5: Method used to apply *S. incanum* and motivation for the method**

| Method | Frequency N (%) | Easier to use N (%) | Covers more area N (%) | Only equipment available N (%) | I have it at home N (%) | Designed for spraying pests N (%) | Directed to the plant N (%) |
|---|---|---|---|---|---|---|---|
| Use of Broom | 28(57%) | 12(43%) | 9(32%) | 1(4%) | 6(21%) | 0(0%) | 0(0%) |
| Nozzle spray | 6(12%) | 1(17%) | 0(0%) | 3(50%) | 0(0%) | 2(33%) | 0(0%) |
| Aerosol spray | 9(18%) | 6(67%) | 0(0%) | 0(0%) | 3(33%) | 0(0%) | 0(0%) |
| Spongy | 6(12%) | 1(17%) | 0(0%) | 1(17%) | 2(33%) | 1(17%) | 1(17%) |
| Total | 49(100%) | 20(41%) | 9(18%) | 5(10%) | 11(22%) | 3(6%) | 1(2%) |

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**Table 6: Perceptions of symptoms of diseases prevalent in the community according to the age of the respondents**

| | Age | | | | | |
|---|---|---|---|---|---|---|
| | 16-50 | | >50 | | Total | |
| **Headache** | 10 | 37% | 4 | 21% | 14 | 30% |
| $\chi^2$(*d.f.* = 1, N = 46) = 1.35; p = .246 | | | | | | |
| **Dizziness** | 4 | 15% | 3 | 16% | 7 | 15% |
| *Chi*²(*d.f.* = 1, n = 46) = 0.01; p = .928 | | | | | | |
| **Skin irritation** | 16 | 59% | 13 | 68% | 29 | 63% |
| $\chi^2$(*d.f.* = 1, N = 46) = 0.40; p = .526 | | | | | | |
| **Nausea** | 11 | 41% | 2 | 11% | 13 | 28% |
| $\chi^2$(*d.f.* = 1, n = 46) = 5.02; p = .025; V = 0.33 Medium | | | | | | |
| **Vomiting** | 7 | 26% | 9 | 47% | 16 | 35% |
| Chi²(*d.f.* = 1, N = 46) = 2.26; p = .133 | | | | | | |
| **Coughing** | 3 | 11% | 0 | 0% | 3 | 7% |
| Chi²(*d.f.* = 1, N = 46) = 2.26; p = .133 | | | | | | |
| **Poor vision** | 1 | 4% | 7 | 37% | 8 | 17% |
| $\chi^2$(*d.f.* = 1, N = 46) = 8.52; p = .004; V = 0.43 Medium | | | | | | |
| **Sweating** | 1 | 4% | 1 | 5% | 2 | 4% |
| $\chi^2$(*d.f.* = 1, N = 46) = 0.07; p = .798 | | | | | | |
| **Fatigue** | 2 | 7% | 0 | 0% | 2 | 4% |
| $\chi^2$(*d.f.* = 1, N = 46) = 1.47; p = .225 | | | | | | |
| **Stomach-ache** | 11 | 41% | 5 | 26% | 16 | 35% |
| $\chi^2$(*d.f.* = 1, N = 46) = 1.02; p = .312 | | | | | | |



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**Table 7: Perceptions of symptoms of diseases prevalent in the community according to the gender of the respondents**

| | Gender | | | | | |
|---|---|---|---|---|---|---|
| | **Male** | | **Female** | | **Total** | |
| **Headache** | 6 | 32% | 8 | 30% | 14 | 30% |
| $\chi^2$(*d.f.* = 1, N = 46) = 0.02; p = .887 | | | | | | |
| **Dizziness** | 2 | 11% | 5 | 19% | 7 | 15% |
| $\chi^2$(*d.f.* = 1, N = 46) = 0.55; p = .457 | | | | | | |
| **Skin irritation** | 10 | 53% | 19 | 70% | 29 | 63% |
| $\chi^2$(*d.f.* = 1, N = 46) = 1.51; p = .220 | | | | | | |
| **Nausea** | 4 | 21% | 9 | 33% | 13 | 28% |
| $\chi^2$(*d.f.* = 1, N = 46) = 0.83; p = .362 | | | | | | |
| **Vomiting** | 3 | 16% | 13 | 48% | 16 | 35% |
| $\chi^2$(*d.f.* = 1, N = 46) = 5.15; p = .023; V = 0.33 Medium | | | | | | |
| **Coughing** | 2 | 11% | 1 | 4% | 3 | 7% |
| $\chi^2$(*d.f.* = 1, N = 46) = 0.85; p = .356 | | | | | | |
| **Poor vision** | 0 | 0% | 8 | 30% | 8 | 17% |
| $\chi^2$(*d.f.* = 1, N = 46) = 6.81; p = .009; V = 0.38 Medium | | | | | | |
| **Sweating** | 1 | 5% | 1 | 4% | 2 | 4% |
| $\chi^2$(*d.f.* = 1, N = 46) = 0.07; p = .798 | | | | | | |
| Fatigue | 1 | 5% | 1 | 4% | 2 | 4% |
| $\chi^2$(*d.f.* = 1, N = 46) = 0.07; p = .798 | | | | | | |
| **Stomach-ache** | 8 | 42% | 8 | 30% | 16 | 35% |
| $\chi^2$(*d.f.* = 1, N = 46) = 0.77; p = .382 | | | | | | |

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