

## KNOWLEDGE TEST ON PEST MANAGEMENT PRACTICES OF VEGETABLE GROWERS

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### ABSTRACT

*Although vegetables are an essential part of a balanced diet, conventional growing methods subject them to a comparatively high level of pesticide consumption. In order to reduce the negative impacts of pesticide use in agriculture, various pest management techniques are combined in a way that works well together to keep pest populations below the point at which economic harm is caused. This study was carried out since there was no exam to gauge the expertise of vegetable growers in Jammu region and Andhra Pradesh state on pest management techniques. The primary goal of this study is to ascertain how much information vegetable growers have about pest management strategies for tomatoes, okra, and brinjal. A total of 86 and 90 items were prepared in accordance with SKUAST-JAMMU and Dr. YSRHU suggested pest management techniques respectively. Pre-testing of knowledge test was done on 64 vegetable farmers who are farming brinjal, okra and tomato in Jammu region and Andhra Pradesh state, afterwards difficulty index and discrimination index were worked out and the items having the values ranging from 30 to 80 and 0.25 to 0.80 were picked accordingly. A total of 77, 81 items were ultimately chosen from a pool of 86, 90 items for Jammu region and Andhra Pradesh respectively. The reliability for the whole test was calculated by using Cronbach alpha whose values are 0.87, 0.87 and 0.89 for Jammu region 0.87, 0.88 and 0.85 for Andhra Pradesh state in brinjal, okra and tomato respectively.*

**Keywords :** knowledge test, pest management, vegetables, vegetable growers

### INTRODUCTION

Agriculture remains the principal source of livelihood for majority of population even today in India (Anonymous, 2011). India is the second largest producer of vegetables next to China. In India, vegetable crops are grown on an area of 7.2 million hectares with an annual production of 11.5 tonnes (Rai, 2007). The extent of crop losses in vegetable crop varies with the crop type, location, damage, potential of the insect- pest and cropping season. Overall insect pests cause about 35- 40 per cent losses in the vegetable crop. (Sardana et. al, 2005). The scenario of Indian agriculture has changed drastically after Green Revolution in the 1960s (Sachdeva, 2007). However excessive and indiscriminate use of pesticides not only increases the cost of production but also results in destruction of beneficial insects. The management strategy to overcome losses caused by pests has largely remained confined to synthetic pesticide based pest management. The overemphasis on the use of synthetic pesticides by the vegetable growers' leads to multitude of problems to human health and ecology. The over reliance on synthetic pesticides has led vegetable growers into "pesticide treadmill".

Integrated pest management (IPM) is often promoted as a viable alternative to sole and over reliance on synthetic pesticides (Hashemi et al., 2008). IPM practice uses a combination of biological, cultural, physical and chemical methods to reduce pest populations. Pest management through the IPM approach should be carried out by developing the right mix of control measures which are cost effective and safe for both the farmer and consumer, and are ecologically sustainable at the same time. IPM may include chemical control; however, pesticides are allowed to be used only as a last resort when other control methods have failed to achieve satisfactory control. IPM practice has played an important role in vegetable production systems and has enabled farmers to improve quality in terms of appearance of vegetables and to minimize input costs. IPM emphasizes the growth of a healthy crop with the least possible disruption to agro-ecosystems and encourages natural pest control mechanisms (FAO, 2013). IPM approaches have succeeded in reducing the use of a number of broad-spectrum pesticides, and have also been shown to be more economical than conventional methods that rely on insecticides. It aims to suppress pest populations below the economic injury level instead of eradication, and helps in making plant protection feasible, safe

and economical, even for the smallholder farmers (Sharma et al., 2009). Farmers typically tend to adopt cost-effective pest management approaches that minimize their financial risks (Zalucki et al., 2009). IPM helps maintain pests at a low level of population by managing the agro-ecosystem to enhance natural enemies and thereby reduce yield losses below economically damaging levels. However, many farmers apply broad-spectrum insecticides to control insect pests for their convenience and rapid results, which in turn impair the balance between insect pests (prey) and natural enemies. This is partly because continuous monitoring of the populations of insect pests, natural enemies and other factors in the natural ecosystem on a regular basis is time-consuming as well as an in-depth knowledge is needed about pests and natural enemies and their behavior (Moser et al., 2008). The objectives of this research were to identify farmers' knowledge about IPM

A test is a set of questions, each of which has a correct answer, to which the people respond. Cronbach (1964) defined a test as a systematic procedure for comparing the behavior of two or more persons at a particular time, or one or more persons at different times. Psychological tests yield objective and standardized descriptions of behavior which can be quantified by numerical scores. One of example of such psychological test is knowledge test. Knowledge is generally understood as an intimate acquaintance of an individual with facts. Knowledge is a body of understood information possessed by an individual or by a culture (English and English, 1961). An appropriate knowledge test helps us to know the relevant level of knowledge of the farmers.

## **OBJECTIVE**

To construct and standardize a test for measuring knowledge of vegetable growers about pest management practices in vegetables

## **METHODOLOGY**

The test was administered to 30 farmers in the R.S. Pura block of Jammu region and 10 farmers from Yerravaripalem mandal in Chittoor district, 10 farmers from Gannavaram mandal in Krishna district, 10 farmers from Ravulapalem mandal in Eastgodavari district of Andhra Pradesh state. Thus, comprising a total of 60 farmers from both the states.

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mondal,2011). One of example of such psychological test is knowledge test. Knowledge is generally understood as an intimate acquaintance of an individual with facts. Knowledge is a body of understood information possessed by an individual or by a culture (English and English, 1961). An appropriate knowledge test helps us to know the relevant level of knowledge of the farmers.

Three knowledge tests for three vegetable crops namely brinjal, tomato and okra were developed for the study. For developing knowledge tests, an attempt was made to review the knowledge tests developed by different researchers for farmers. The knowledge tests developed by Peshin et al (2007), Sharma (2011), Yangsdon (2016), Bano (2019), Kumar (2023) were consulted and statements based on the objectives of the study were prepared. The review of literature gave a broader viewpoint of the types of knowledge to be tested, type of items, number of items and scoring procedure of the items of the knowledge test. Three knowledge tests for brinjal, tomato and okra were developed with slight modification to one developed by Bhatia (1990) and Peshin et al (2007), having following steps:

### **Definition of knowledge**

The definition of knowledge is the first step in the construction of a knowledge test (Bhatia, 1990). Knowledge not just involves addition of information but at the same time involves the reflection of experiences, beliefs, values, feelings etc. of an individual. Bloom (1956) defines knowledge as "behaviour and test situations which emphasize the remembering, either by recognition or recall, of ideas, material or phenomena".

### **Statement of process objectives**

The process objectives were in terms of the following cognitive processes of a farmer about the pest management practices in vegetables.

- Recalls or recognizes the terms, concepts, specimen (knowledge of specifics)
- Knowledge of ways and means of dealing with specific problems
- Knowledge of the universals and abstractions in a particular field

### **Content area**

The content area or the questions of knowledge covered by the knowledge test were:

- farmers' knowledge about pest management practices

- farmers' knowledge about botanicals
- farmers knowledge about insect pests, and diseases commonly found in vegetable crop eco-system
- farmers knowledge about natural enemies
- farmers' knowledge about harmful effects of pesticide use

### Preparation of test blueprint and writing test items

The next step in the construction of the knowledge tests was the preparation of a blueprint of the test in order to determine the type of items, number of items to be included in the test and the scoring pattern of the test. Test items for knowledge tests were written in consultation with the specialist from the content area and process area and after discussion, 30 knowledge statements for brinjal, 29 knowledge statements for tomato and 26 knowledge statements for okra were modified as per suggestions. Accordingly, relative emphasis was given on the following:

- **Type of items:** The items of the knowledge tests contained 30 items (15 open-ended and 3 true/false test items, 4 multiple-choice and 8 identification items) for brinjal, 29 (13 open-ended and 3 true/false test items, 5 multiple-choice and 8 identification items) items for tomato and 26 items (13 open-ended and 2 true/false test items, 3 multiple-choice and 8 identification items) for okra.
- **Number of items:** The knowledge test constructed for brinjal comprised of 30 items, 29 items for tomato and for okra comprised of 26 items.
- **Scoring of items:** differential scoring pattern was employed for test of knowledge tes depending on the importance of an item. Weight-age scheme was decided after consulting the scientists from the field of extension education, vegetable science and entomology.

### Standardization of test

One of the crucial steps in developing a final set of statements that accurately represent the subject matter and goals of a study that a researcher is interested in is standardizing the knowledge test. By keeping only pertinent statements about the degree of difficulty and discrimination, standardization aims to abbreviate the test while guaranteeing that it satisfies validity and reliability requirements. The knowledge exam was pre-tested in the non-sampled areas to standardize the items and identify any ambiguity or weaknesses in the test items. The necessary modifications were made to the knowledge test following pre-testing. The knowledge test's discrimination and difficulty indices

guaranteed its content validity. Final knowledge test contained 27 questions (13 open-ended and 3 true/false, 3 multiple-choice and 8 identification questions) in brinjal, 26 questions (11 open-ended and 3 true/false, 4 multiple-choice and 8 identification questions) in tomato and 23 questions (11 open-ended and 2 true/false, 2 multiple-choice and 8 identification questions) in okra.

### Item analysis

Item analysis is the process of examining each test item in terms of its degree of difficulty, discriminatory power, and relationship to the rest of the test. The discrimination index aids in evaluating how well the item separates responders with greater and less knowledge, while the difficulty index indicates how challenging the item is. Each item on the schedule is subjected to statistical processes to generate a few sorts of values, and the respondents' knowledge scores are calculated based on the scoring pattern and placed in ascending order (Bhatia, 1990; Reddy et al., 2014; Vegad et al., 2021; Sudhanand et al., 2024; Rathwa et al., 2023; Dadheech et al., 2024).

#### i) Difficulty index

The difficulty index of an item was defined as the proportion of respondents giving correct answer to that particular item (Dadheech et al., 2024; Chandran et al., 2024; Abhishek et al., 2023; Dodiya et al., 2023; Rathavi et al., 2023; Mallappa et al. 2023) and can be calculated by the following formula:

$$DI = \frac{nc}{N} \dots \dots \dots (3.2)$$

Where

DI = Difficulty index

nc = number of respondents who answered the question correctly and

N = Total number of respondents

#### ii) Discrimination index

It expresses the extent to which to which an item discriminates among the subjects who differ sharply in their knowledge measured by the test as a whole. Discrimination index can be calculated by first arranging the items in descending order and dividing the upper 25 % and lower 25 % items as high and low group and then applying the following formula:

$$d_i = \frac{n_1H - n_2L}{(n_1 + n_2)} \dots \dots \dots (3.3)$$

Where,

$d_i$  = discrimination index

= number of respondents in 25 % high group who answered correctly

= number of respondents in 25 % low group who answered correctly

= total number of respondents in high and low group respectively

$$\alpha = \frac{N}{N-1} (1 - \frac{\sum_{i=1}^N \delta^2 y_i}{\delta_{x^2}})$$

Where,

$\alpha$  = Cronbach's alpha

N = number of components (items or test lets)

= variance of the observed total test score variance of component i.

**Validity of the test**

The term validity means 'truth' or 'fidelity'. Validity of a test can be defined as the accuracy with which it measures that which is intended to measure. Validity therefore refers to the degree to which a test measures what it claims to measure. Content validity was ensured initially by administering each item to different experts for evaluating the representation of universe the test, its relevance and appropriateness.

**Reliability of the test**

Reliability tells us whether a test is likely to yield the same results if administered to the same group of test-takers multiple times. It is the consistency with which a test measures whatever it measures. We can repose confidence in a measuring instrument only if it gives consistent results over different occasions or over different samples of the same performance domain (Meenakshi, 1994).

**Cronbach's Coefficient Alpha:**

Developed by Lee Cronbach in 1951, Cronbach's alpha is a measure of internal consistency i.e., how closely are a set of items related as a group. It is considered to be a measure of scale reliability. Technically speaking, it is not a statistical test but is a coefficient of reliability (or consistency). Cronbach's alpha generally increases when the correlations between the items increase. It is calculated by the formula:

**RESULTS AND DISCUSSION**

The knowledge test items having the difficulty index ranging from 30 to 80 and discrimination index ranging from 0.25 to 0.8 0 were selected for the final knowledge tests of brinjal, tomato and okra. Even though the test items about economic threshold level, name of the parasitoids used for pest management and number of parasitoids released per acre in weekly intervals are very important, because of 0.00 discrimination index score they were removed from the final knowledge test. This is one of the limitations of discrimination index. Furthermore, the coefficient of reliability calculated through Cronbach's alpha was presented in Table 2.

**Table 1 : Final format of the knowledge test with their difficulty and discrimination index**

Sr. No.	Brinjal	Difficulty Index		Discrimination Index	
		Jammu	AP	Jammu	AP
1	Crop rotation should be followed in brinjal crop? Yes/No	56.67	63.33	0.6	0.8
2	Which type of nursery bed is recommended for planting in brinjal? a) Sunken bed b) Flatbed c) Raised bed d) None of the above	NA	70.00	NA	0.3
3	What are the benefits of the recommended nursery bed in brinjal?	NA	60.00	NA	0.25
4	Which material is used for soil solarization in brinjal?	NA	53.33	NA	0.6
5	What are the benefits of soil solarization in brinjal?	NA	30.00	NA	0.25
6	Name any two recommended varieties in brinjal crop	60.00	66.67	0.40	0.35
7	What is the recommended seed rate in brinjal crop?	51.67	33.33	0.25	0.40
8	What is the recommended bio-pesticide and chemical used for seed treatment in brinjal crop?	63.33	33.33	0.30	0.50
9	What is the dosage of seed treating bio-pesticide and chemical in brinjal crop?	71.67	36.67	0.25	0.60
10	What is the recommended fertilizer schedule in the brinjal crop?	43.33	53.33	0.50	0.70

Sr. No.	Brinjal	Difficulty Index		Discrimination Index	
		Jammu	AP	Jammu	AP
11	Crop monitoring should be done at least a) Once in a day b) Once in a week c) Once in a fortnight d) Once in a month	35.00	36.67	0.60	0.80
12	Name any three mechanical methods of pest control in brinjal crop	36.67	80.00	0.50	0.50
13	Should the infested foliage and fruits be removed and destroyed from the field? Yes/No	33.33	45.55	0.20	0.30
15	Should pesticides spray be? a) Site specific ----- b) Whole area under the crop -----	70.00	51.67	0.30	0.25
16	Have you heard about IPM? Yes/No	50.00	33.33	0.50	0.25
17	If yes, what do you understand by IPM?	53.33	36.67	0.50	0.30
18	What are the harmful effects of the pesticide use?	33.33	43.33	0.25	0.50
19	Identify the insects shown to you and specify whether these are harmful or beneficial.	50.00	73.33	0.40	0.30
20	Identify the diseases from the infested material	53.33	75.00	0.70	0.30
<b>Tomato</b>					
21	Crop rotation should be followed in tomato crop? Yes/No	63.33	60.00	0.80	0.40
22	Which type of nursery bed is recommended for planting in tomato? a) Sunken bed b) Flatbed c) Raised bed d) None of the above	70.00	51.67	0.30	0.25
23	Name any two recommended varieties of tomato crop	60.00	63.33	0.70	0.30
24	What is the recommended seed rate of tomato crop?	76.67	71.67	0.50	0.25
25	What is the recommended bio-pesticide and chemical used for seed treatment in the tomato crop crops?	53.33	43.33	0.25	0.50
26	What is the dosage of seed treating bio-pesticide and chemical in the tomato crop crops?	33.33	35.00	0.40	0.60
27	Name the trap crop grown in tomato?	50.00	36.67	0.30	0.50
28	What is the ratio of trap crop to the tomato crop? a) 1:2 b) 1:4 c) 1:8 d) 1:16	53.33	33.33	0.60	0.20
29	What is the recommended fertilizer schedule in the tomato crop?	80.00	70.00	0.50	0.30
30	Crop monitoring should be done at least a) Once in a day b) Once in a week c) Once in a fortnight d) Once in a month	36.67	50.00	0.40	0.50
31	Name any three mechanical methods of pest control in the tomato crop	60.00	53.33	0.40	0.50
32	Should the infested foliage and fruits be removed and destroyed from the field? Yes/No	53.33	33.33	0.25	0.25
33	Should pesticides spray be? a) Site specific ----- b) Whole area under the crop -----	30.00	50.00	0.30	0.40
34	Have you heard about IPM? Yes/No	66.67	53.33	0.25	0.70
35	If yes, what do you understand by IPM?	33.33	33.33	0.50	0.40
36	What are the harmful effects of the pesticide use?	33.33	70.00	0.60	0.30
37	Identify the insects shown to you and specify whether these are harmful or beneficial.	36.67	60.00	0.50	0.40
38	Identify the diseases from the infested material	60.00	73.33	0.25	0.60
<b>Okra</b>					
39	Name any two recommended varieties of okra	63.33	63.33	0.80	0.80
40	What is the recommended seed rate in okra?	70.00	70.00	0.30	0.3
41	What is the recommended bio-pesticide and chemical used for seed treatment in the okra?	60.00	73.33	0.25	0.25
42	What is the dosage of seed treating bio-pesticide and chemical in okra?	53.33	80.00	0.60	0.60

Sr. No.	Okra	Difficulty Index		Discrimination Index	
		Jammu	AP	Jammu	AP
43	Name the barrier crop grown in okra?	30.00	60.00	0.25	0.40
44	What is the recommended fertilizer schedule in okra?	66.67	53.33	0.35	0.60
45	Crop monitoring should be done at least a) Once in a day b) Once in a week c) Once in a fortnight d) Once in a month	33.33	30.00	0.40	0.25
46	Name any three mechanical methods of pest control in okra	33.33	80.00	0.50	0.70
47	Should the infested foliage and fruits be removed and destroyed from the field? Yes/No	36.67	80.00	0.60	0.50
48	Should pesticides spray be? a) Site specific -----b) Whole area under the crop-----	53.33	33.33	0.70	0.25
49	Have you heard about IPM? Yes/No	36.67	37.50	0.80	0.80
50	If yes, what do you understand by IPM?	80.00	33.33	0.50	0.40
51	What are the harmful effects of the pesticide use?	45.55	30.00	0.30	0.60
52	Identify the insects shown to you and specify whether these are harmful or beneficial.	51.67	66.67	0.25	0.70
53	Identify the diseases from the infested material	33.33	71.67	0.25	0.40

**Table 2 : Coefficient of reliability calculated through Cronbach’s alpha**

	Jammu			Andhra Pradesh		
	Brinjal	Tomato	Okra	Brinjal	Tomato	Okra
<b>Coefficient of reliability</b>	0.87	0.87	0.89	0.87	0.85	0.88

**CONCLUSION**

An effort was made to create a knowledge test using standard measurement device. Item analysis, reliability and validity calculations were used to measure the instruments stability and the results shows that test items were neither too easy not too difficult to discriminate well between well informed and poorly informed individuals and the instrument is reliable and valid for future usage.

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**CONFLICT OF INTEREST**

There is no conflict of interest among the authors.

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