Current Journal of Applied Science and Technology

32(6): 1-6, 2019; Article no.CJAST.47094
ISSN: 2457-1024
(Past name: British Journal of Applied Science & Technology, Past ISSN: 2231-0843, NLM ID: 101664541)

Developing an Intellectual Learning Scale to Test Knowledge Level of Kiwi Growers of Arunachal Pradesh on Package of Practices of Kiwi

Bai Koyu[1*], Rajkumar Josmee Singh[1], L. Devarani[1], Ram Singh[1] and L. Hemochandra[1]

[1]School of Social Sciences, College of Post Graduate, Studies in Agricultural Sciences, Central Agricultural University, Meghalaya, 793103, India.

Authors' contributions

This work was carried out in collaboration between all authors. Authors BK and RJS designed the study, wrote the protocol, performed the statistical analysis, managed the analyses of the study and wrote the first draft of the manuscript. Authors LD, RS and LH supervised the work, managed the literature searches and edited the manuscript. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/CJAST/2019/v32i630039
Editor(s):
(1) Dr. Umar Nirmal, Senior Lecturer, Centre of Advanced Mechanical and Green Technology, Faculty of Engineering and Technology, Multimedia University, Malaysia.
Reviewers:
(1) Javan Ngeywo, Kenya.
(2) Rocky Thokchom, Pandit Deen Dayal Upadhyay Institute of Agricultural Sciences, India.
Complete Peer review History: http://www.sdiarticle3.com/review-history/47094

Original Research Article

Received 07 November 2018
Accepted 13 February 2019
Published 23 February 2019

ABSTRACT

The knowledge test was developed to measure the knowledge level of kiwi growers. In all 36 items were predominantly fabricated on the basis of indorsing rational rather than root memorization and to discriminate the sound knowledgeable kiwi growers from the ailing knowledgeable ones. The scores obtained from sample respondents were imperilled to item analysis, embracing of item difficulty index & item discrimination index. In the ultimate selection, the scale consisted of 15 items with difficulty index ranging from 30-80 and discrimination index ranging from 0.30 to 0.55. Split-Half method was employed to check the reliability of knowledge test being developed and it was found to be 0.711.

Keywords: Knowledge test; Kiwi growers; difficulty index; discrimination index; reliability.

**Corresponding author: E-mail: bai.koyu07@gmail.com;*

1. INTRODUCTION

Kiwi belongs to the genus Actinidia (Actinidiaceae) and is derived from a deciduous, woody fruiting vine. It is composed of different species and cultivars that parade a multiplicity of physical features and sensory attributes. Kiwi plants were initially grown in mountainous, forested regions of China (as Chinese gooseberry), where it is also identified as mihoutau [1,2]. During early 20th century its seeds were brought to New Zealand, where it was ultimately domesticated, rechristened, and vended globally. At present, commercial growth of the fruit has spread to voluminous countries including the United States, Italy, Chile, France, Greece, Brazil, and Japan [3,4,5]. Some of the major producing districts in Arunachal Pradesh are Upper Siang, Tawang, Dibang Valley, Lower Subansiri and West Kameng. Kiwi is a multi-nutritional berry as it has high contents of Vitamin C and total polyphenols, which ranges from 92 mg – 132 mg per 100 g of fresh weight [6]. Kiwi fruit was first introduced in India in 1963 in Shimla [7] and later spread to other part of the country. Introduction of kiwi in Arunachal Pradesh is of recent and has assumed tremendous popularity and preference among the growers as well as consumers due to its favourable properties for easy maintenance and marketing besides having high nutritional and medicinal values. The kiwifruit of the state has already attained commercial identity not only in the local markets but also in the national as well as international markets. The total area and production under kiwi cultivation during the year 2015-16 was reported to be 4052 Ha and 4956 MT as well as productivity of 1.22 respectively [8]. Developing an efficient value chain in Arunachal Pradesh is a challenge because of numerous institutional and infrastructural constraints like lack of research, extension support, non-availability of reliable data on production, pitiable credit support, lack of organized marketing and post-harvest infrastructure etc. as indicated by Mani et al. [9]. Majority (95.31%) of the kiwifruit growers voiced their financial constraints as the main constraints. In case of inputs, 34.37% faced constraints like shelf life of fruits, manure and planting material, while 78.12% carped about labour constraints, 60.41% were voiced technical constraints like awareness and pest management. 83.85% voiced the marketing problem like transportation, processing unit, refrigerator van, cold storage etc. as indicated by Chavai et al. [10]. Apart from regular plant management necessities of raising a fruit crop, comprising apposite irrigation, fertilization, pollination and pruning, the superiority of kiwiberry production is also determined by precise timing and method of harvesting which affect shelf life and storage [11,12,13]. In this perspective, the knowledge of farmers is of utmost importance.

Knowledge is an important tool, which facilitates farmers in decision making to adopt the recommended practices to make kiwi farming more profitable and sustainable. The knowledge test of kiwi may also create the cognizance about prominence of espousing scientific cultivation practices by the growers as well as help to bond the knowledge gap between the farmer and researcher and harvest gap between farmer's field and research station. Thus, it may also expedite the growers to increase the turnover and have improved livelihood security, capability to educate their children, secured source of income and reduced vulnerability. On this milieu, an attempt was made to develop knowledge test on kiwi cultivation practices for its application to the farmers in Arunachal Pradesh.

2. MATERIALS AND METHODS

Item assortment: The content of knowledge test was composed of questions called items. Items for the test were compiled from different sources, such as literature, field extension personnel, subject matter specialists in horticulture and the researcher's own experiences. The questions were designed to test the knowledge level of kiwi growers about package of practices of kiwi.

Pilot miscellany of items: The assortment of items was done on the basis of the following standards:

(i) It should indorse cogent rather than rote-memorization, and
(ii) It should extricate the well-informed kiwi growers from the ill-informed ones and have a convinced difficulty value. Based on these two methods 36 items were primarily collected for creation of the knowledge test which were in objectives form *i.e.* dichotomous or multiple choice format. A schedule was thus prepared with these 36 items for administering it to the kiwi growers for item analysis and screen out supplementary items.

3. RESULTS AND DISCUSSION

3.1 Preliminary Administration of Test

Items were pretested and modified by administering to 30 randomly selected kiwi growers. Score was given as '1' for right and 0 for wrong answer for each of the 36 items. The total correct response was the knowledge score obtained by an individual farmer. The farmers were then distributed into 6 groups (G1 to G6) each having 5 farmers. The farmers in each group were arranged in plunging order according to the scores obtained by them. Only four extreme groups with high and low scores were ruminated for calculation of item difficulty and item discrimination indices.

3.2 Item Analysis

The item analysis of a test yields two kinds of information: item difficulty and item discrimination as reported by Guilford [14]. The index of item difficulty exposed how difficult an item was whereas the index of discrimination specified the magnitude to which an item discriminates to well notify individuals from the ill-informed ones.

3.3 Item Difficulty Index (Pi)

The difficulty index of an item was defined as the proportions of kiwi growers giving precise responses to that particular item. This was calculated by the formula:

$$P_i = n_i/N_i \, X100$$

Where,

P_i = Difficulty index in percentage of the i^{th} item.
n_i = Number of kiwi growers giving correct response to i^{th} item.
N_i = Total number of kiwi growers to whom i^{th} item was administered.

3.4 Item Discrimination Index

The discrimination index was calculated by employing the method given by Mehta [15]. Item discrimination index was calculated by the formula given below:

$$E^{1/3} = \frac{(S1 + S2) - (S5 + S6)}{N/3}$$

Where, S1, S2, S5 and S6 were the respective frequencies of correct answers in G1, G2, G5 and G6 groups respectively, and N = Total number of kiwi growers in the sample of item analysis.

3.5 Selection of Items for Test

Two standards *i.e.* item difficulty index and item discrimination index were calculated for throng of items in the ultimate set-up of the knowledge test. In the present study, items with difficulty index indecisive from 30 to 80 and discrimination index indecisive from 0.30 to 0.55 were included in the ultimate set-up of the knowledge test. Item difficulty index and item discrimination index of all the 36 items were calculated and 15 items which satisfied both the criterions were selected for the ultimate set-up of knowledge test as shown in Table 1.

Table 1. Difficulty Index (DI) and Discrimination Index (Disc. Index) for knowledge test items

Item no	Statements	DI	Disc. index	S= Selected item and R = Rejected item
1.	Which of the following variety of kiwi is/are recommended for your area? Kindly suggest any other variety if you know.	70	0.9	R
2.	Do you know the most suitable time/month for plantation of kiwi and its follow-up?	76.67	0.7	R
3.	Do you know the optimum temperature during the growing season for kiwi cultivation?	60	0.7	R
4.	Which of the following is/are the soil recommended for improved kiwi cultivation?	80	0.4	S
5.	Do you know seed treatment of kiwi for improved cultivation? If yes, kindly share your knowledge/skill.	26.67	0.3	R
6.	Which of the following is/are the recommended pit size for kiwi seedling transplantation?	63.33	0.6	R
7.	What is/are the recommended spacing for kiwi cultivation?	56.67	0.1	R
8.	What do you understand by the term training of kiwi?	90	0.1	R

Item no	Statements	DI	Disc. index	S= Selected item and R = Rejected item
9.	Which type of training system is widely used in kiwi plantation?	86.67	0.1	R
10	What do you understand by the term pruning of kiwi?	83.33	0.1	R
11.	In a year, kiwi can be pruned on how many occasions?	36.67	-0.2	R
12.	What do you understand by the term fruit thinning of kiwi?	36.67	0.1	R
13	Fruit thinning should be done at the early stages of fruiting?	76.67	0.1	R
14.	Whether male kiwi plants bear fruits or not?	70	0.4	S
15.	Kiwi is a dioecious plant or not?	60	0.3	S
16.	Whether a kiwi plant can tolerate water stagnation or not.	53.33	0.1	R
17.	What is/are the quantity of farm yard manure to be incorporated during planting? (per vine/year)	56.67	0.9	R
18.	What is/are the total recommended fertilizer dozes for improved kiwi cultivation?	53.33	0.5	S
19.	Which of the following is/are the recommended time period for irrigation?	60	0.9	R
20.	Which of the following irrigation system is/are the recommended for large commercial plantation of kiwi?	73.33	0.3	S
21.	Do you know about weeding schedule in kiwi? If yes, how do you follow the recommended schedule of weeding to control the weed?	63.33	0.5	S
22.	Do you know what kind of material is used for mulching kiwi tree?	63.33	0.2	R
23.	Name the important pests of kiwi.	63.33	0.4	S
24.	Name the diseases of kiwi.	60	0.3	S
25.	Do you know IPM on improved kiwi cultivation? Please share important IPM techniques on improved kiwi cultivation.	20	0.5	R
26.	Which method of propagation of kiwi yields early maturing of fruits?	73.33	0.3	S
27.	What do you understand by the term Hybrid? If yes, mention hybrid varieties of kiwi.	26.67	0.4	R
28.	In which of the following year/years commercial bearing of kiwi fruits begins?	66.67	0.1	R
29.	Which of the following is/are the indication for harvesting of kiwi?	63.33	0.4	S
30.	Which of the following is/are reason for acidic taste of kiwi fruits?	70	0.4	S
31.	Which of the following is/are the optimum temperature during the storage of kiwi?	63.33	0.3	S
32.	Which of the following is/are results of keeping bee colonies in kiwi orchard?	50	0.5	S
33.	Which of the following is/are the storage life of kiwi fruits after harvesting?	36.67	0.2	R
34.	What do you understand by the term ‘’grading of kiwi.” If you know, please mention grading of kiwi fruits is done on what basis?	40	0.3	S
35.	Which of the following is/are the materials used for packing kiwi fruits?	36.67	-0.1	R
36.	Do you know and visit nearby market where kiwi auction is held to market the produce?	60	0.3	S

3.6 Reliability

The reliability of knowledge test being developed was tested by using Split-Half method: The coefficient of correlation between two sets of scores was calculated and found to be 0.711 was significant at 1% level thus indicating that the internal consistency of the knowledge test developed for the study was relatively high. Knowledge test on package of practices of paddy included 35 item statements as reported by Sureshverma et al. [16]. Knowledge test for cotton farmers on health hazards of pesticides usage included 26 item statements as indicated

by Reddy et al. [17]. Knowledge test of farmers on chickpea demonstration consisted of 15 item statements in the final selection as indicated by Kebede and Amare [18]. Knowledge test for farmers on SRI technology comprised of 33 item statements as reported by Kumar et al. [19]. Knowledge test developed for agricultural extension personnel on m-tools comprised of 14 item statements in final selection as reported by Kumari and Husain [20].

3.7 Content Validity of Knowledge Test

In the final selection of items, caution was taken to contain items covering the whole universe of pertinent behavioral facets of the respondents with respect to knowledge about kiwi growing practices. Items were collected through various sources including whizzes and henceforward it was presumed that the scores obtained by administrating this test had measured the knowledge of the respondents as envisioned.

4. CONCLUSION

In terms of entrepreneurship development, scientific knowledge of growing kiwi is of prime importance. It is also crucial for assessment and concocting of need based arrangement for the socio economic development of kiwi growers. But hardly there is any such standard procedure for testing the knowledge level of kiwi growers. With this circumstantial a knowledge test scale was developed to contemplate the knowledge level of the kiwi growers. Knowledge test constructed was found to be exceedingly firm and consistent for measurement of the knowledge level of the kiwi growers. So, out of the aggregate 36 item statements only 15 item statements were incorporated in the final knowledge test.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Motohashi N, Shirataki Y, Kawase M, Sakagami H, Satoh K, Kurihara T, Nakashima H, Mucsi I, Varga A, Molnár J. Cancer prevention and therapy with kiwifruit in Chinese folklore medicine: A study of kiwifruit extracts. Journal of Ethnopharmacology. 2002;81:357-364.
2. Ferguson AR, Ferguson LR. Are kiwifruit really good for you? Acta Horticulturae. 2003;610:131-135.
3. Nishiyama I. Fruits of the *Actinidia* genus. Advances in Food and Nutrition Research. 2007;52:293-324.
4. Ferguson AR. Kiwifruit cultivars: Breeding and selection. Acta Horticulturae. 1999;498:43-51.
5. Ferguson AR. New temperate fruits: *Actinidia chinensis* and *Actinidia deliciosa*. In: Janick J, Ed Perspectives on New Crops and Their Uses. Alexandria, VA: ASHS Press. 1999;342-347.
6. Park Y, Jung S, Kang S, Drzewiecki J, Namiesnik J, Haruenkit R, Barasch D, Trakhtenberg S, Gorinstein S. *In vitro* studies of polyphenols, antioxidants and other dietary indices in kiwifruit (*Antinidia deliciosa*). International Journal of Food Sciences and Nutrition. 2006;57(1/2):107-122.
7. Rathore DS. Kiwi fruit production: Present status and future prospects. In: Productivity of Temperate Fruits – Issues and Strategies (Ed. K. K. Jindal, D. R. Gautam), ICAR-UHF Publications. 2001; 355-364.
8. Horticulture Annual Report (2015-16). Directorate of Horticulture, Government of Arunachal Pradesh, India; 2016.
9. Mani G, Kundra A, Haque A. Kiwi value chain in Arunachal Pradesh: Issues and prospects. Agricultural Economics Research Review. 2018;31(1):123-130.
10. Chavai AM, Ali H, Patil RL. Constraints encountered by kiwifruit growers of Arunachal Pradesh. Contemporary Research in India. 2018;8(2):112-115.
11. Fisk CL. Investigation of postharvest quality and storability of hardy kiwifruit (*Actinida arguta* 'Ananasnaya'). MS Thesis. Submitted to Oregon State University. Corvallis, Oregon, United States of America; 2006.
12. Fisk CL, McDaniel M, Strik BC, Zhao Y. Physicochemical, sensory, and nutritive qualities of hardy kiwifruit (*Actinidia arguta* 'Ananasnaya') as affected by harvest maturity and storage. Journal of Food Science. 2006;71:204-210.
13. Latocha P, Krupa T, Radzanowska J. Changes in postharvest physicochemical and sensory characteristics of hardy kiwifruit (*Actinidia arguta* and its hybrid) after cold storage under normal versus

controlled atmosphere. Postharvest Biology and Technology. 2014;88:21-33.
14. Guilford JP. New standards for test evaluation. Educational and Psychological Measurement. 1964;6:427-439.
15. Mehta P. A study of communication of agricultural information and the extent of distortion occurring from district to village level workers in selected IADP districts. Ph.D. Thesis, Submitted to University of Udaipur, Rajasthan, India; 1958.
16. Sureshverma R, Samuel G, Rao SI, Qudsiyajamal K. Construction of knowledge test to measure the paddy growers knowledge on recommended crop production package of practices in Tamil Nadu state. International Journal of Current Advanced Research. 2017;6(5): 3867-3871.
17. Reddy PN, Lakshmi T, Prasad, SV. Standard test to measure knowledge of cotton farmers on health hazards of pesticides usage in Kurnool district of Andhra Pradesh. 2014;7(5):24-29.
18. Kebede B, Amare G. Measurement of knowledge of farmers on chickpea demonstration at Adola Rede district, Guji Zone, Oromia regional state, Ethiopia. Journal of Agricultural Science and Food Research. 2018;9(3):1-6.
19. Kumar GA, Sailaja V, Satyagopal PV, Prasad SV. Construction and standardization of knowledge test to measure the knowledge level of farmers on SRI technology. Indian Research Journal of Extension Education. 2015;15(4):161-166.
20. Kumari NK, Husain AS. A standardised knowledge test to measure the extent of knowledge of agricultural extension personnel on m-tools. 2016;28(1):5614-5619.

Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sdiarticle3.com/review-history/47094