Preference Analysis of Pigeonpea Varietal Attributes AmongFarmers and Traders in KalyanaKarnataka Region: A Conjoint Analysis Approach

ABSTRACT

Pulses play important role in the farming economy of Kalyana-Karnataka region. The study was carried out to identify the attributes of pigeonpea varieties preferred by both the farmers and traders using conjoint analysis technique. Multistage purposive random sampling technique was used for selection of respondents. Totally 120 farmers constituting 40 from each districts growing TS-3R and GRG-811 was selected from Bidar, Kalaburagi and Yadgir districts along with 30 pigeonpea traders 10 from each district were selected for the study. The findings of the study indicated that Kalyana Karnataka region is primarily inclined by attributes such as output price, crop duration, resistance to pests and diseases, and yield levels. Farmers prioritize varieties with higher output prices and shorter crop durations. Resistance to wilt and pod borer, along with minimal flower drop, are also significant factors. Farmers aim for yields exceeding 6 to 7 quintals per acre, alongside output prices above Rs.7000.Pigeonpea traders in the study area prioritize moisture content, thickness of seed coat, and recovery percentage for milling. Grains with less than 8% moisture content and thin seed coats are preferred. Recovery rates above 80% and longer keeping quality are also favored, while raw material price holds minimal importance. Conjoint analysis is finding increasing application in the field of market research and wider management decision- making. Hence, in the present study, it was used to measure the farmer's and trader's preference for the pigeonpea quality attributes.This study highlights the pivotal attributes guiding farmer and trader preferences for pigeonpea varieties in Kalyana-Karnataka region. Through conjoint analysis, it reveals crucial factors shaping variety selection and market dynamics. Future researchers can leverage these insights to optimize agricultural interventions and enhance crop productivity in similar contexts.

Keywords*: Variety, Attributes, Preferences, TS-3R, GRG-811, Farmers, Traders,*seed coat,yields exceeding

1. INTRODUCTION

Pigeonpea (Cajanus cajan (L) mill.sp.) is one of the major pulse crops of tropics and sub-tropics and owed with several unique characters. It ranks second important pulse crop next to bengalgram. It finds an important place in farming systems adopted by small holding peasants in developing countries. Pigeonpea is considered to be origin of Peninsular India. In India, Redgram takes the second position in total pulse production with 4.25 million tonnes of production in an area of 4.43 million hectares in the year 2017-18 at a productivity level of 960 kg/ha. Among the states Maharashtra is the major producer with 1.07 million tonnes of production followed by Madhya Pradesh (0.84 million tonnes) and Karnataka (0.77 million tonnes) (B. Rajendrer et al. 2018)[7]. Nutritionally, 100 g of redgram contains 22.40 g of protein, 48.19 g of carbohydrates 2.74 g of fat and around 1.39 mg of Calcium 2.3 mg of Zinc (Taalari et al. 2018)[11]. Northern parts of Karnataka accounts nearly 90 percent of total pigeonpea area in the state. In Karnataka, pigeonpea is grown in an area of 8.9 lakh hectares with production of 8.2 lakh tonnes and productivity of 1150 kg/ha. Major Pigeonpea growing districts in Karnataka are Kalaburagi, Vijayapur, Bidar, Yadgiri, Bellary, Bagalkot and Raichur. It is largely grown in the northern parts of the state especially in Kalyana-Karnataka region where the Kalaburagi, Bidar and Yadgir districts accounted about 51.67 % to the total production of the state (Suresh K. et al. 2016)[10].

The preferences of farmers for pigeonpea varieties in the Kalyana Karnataka region are deeply influenced by key attributes such as crop duration, resistance to pests and diseases,

output price, and yield levels(Shah et al. 2018)[8]. Through conjoint analysis, it's evident that attributes like resistance to wilt and pod borer, along with minimal flower drop, significantly impact farmers' decisions. Short crop durations, high yields (above 6-7 quintals per acre), and favorable output prices (exceeding Rs.7000 per quintal) are also highly favored. Such preferences are crucial for optimizing market viability and ensuring farmers' welfare. By aligning variety attributes with market demands, farmers can secure better returns, enhancing their economic well-being. Moreover, selecting varieties based on resistance to pests and diseases ensures reduced production risks, promoting sustainability. These findings underscore the importance of market-oriented variety selection strategies, fostering improved marketing opportunities and ultimately enhancing farmers' livelihoods in the pigeonpea sector.

This research underscores the key factors influencing the choices made by farmers and traders when selecting pigeonpea varieties in the Kalyana-Karnataka region. By employing conjoint analysis, it elucidates the significant aspects driving variety selection and shaping market dynamics. These findings offer valuable insights for future studies aiming to improve agricultural interventions and boost crop productivity in comparable settings.

2. METHODOLOGY

2.1 Sampling procedure and Selection of the districts

The three districts viz., Kalaburagi, Bidar and Yadgir districts of Kalyana Karnataka were purposively selected as area under pigeonpea is relatively higher in these three districts of the region. These three districts of Kalyana-Karnataka region contribute about 51.67 % to pigeonpea production of the State. Multistage purposive random sampling technique was used for selection of respondents. In the first stage, three districts of Kalyana-Karnataka region viz.Bidar, Kalaburagi and Yadgir were selected based on pigeonpea production potential. At the second stage, six taluks constituting two taluks from each selected district were choosen using same criterion, in consultation with Raitha Samparka Kendra (RSK), Krishi Vigyan Kendra (KVK) and Agricultural Extension Education Centre (AEEC). Further, twenty (20) farmers growing TS-3R and GRG-811 varieties from each taluk were chosen randomly using same criterion as mentioned above in the second stage. In total, 120 sample constituting 60 farmers each growing TS-3R and GRG-811 varieties respectively and 30 pigeonpea traders ten (10) from each district were selected for the study.

2.2 Analytical Tools

2.2.1. Conjoint Analysis

Conjoint analysis, a versatile marketing research technique, is invaluable for various aspects of decision-making, including new product development, market segmentation, pricing decisions, and competitive analysis. In the context of the present study focusing on pigeonpea quality attributes, conjoint analysis was utilized to gauge the preferences of farmers and traders. The method involves identifying critical attributes and their feasible levels, represented by orthogonal variables on 18 cards (Halbrendt et al., 1991)[3]. Respondents rank these profiles based on their preferences, allowing conjoint analysis to derive utility scores, known as part-worths, for each factor level.

This approach, by eliciting choices from respondents, provides insights into the relative importance of different attributes. While two-factor-at-a-time trade-off methods are less common today, the full concept method, which considers all factors simultaneously, offers a more realistic approach. In this method, respondents rank or score profiles representing different combinations of factor levels, enabling the derivation of utility scores and the assessment of the relative importance of each factor. Such information is invaluable for optimizing new varieties and predicting outcomes like sales based on various combinations of factor levels.

These attributes and levels resulted in 18 profile solutions. Since, the number of all possible combinations of these 6 attributes was too large for evaluation, a computer software package, and "SPSS" (Statistical Package for Social Sciences) was employed to select a subset of 18 pigeonpea profiles which represent the most likely ones. Each profile was described on a separate card called plan cards. The respondents who cultivated that pigeonpea were interviewed. Each respondent was shown a randomly mixed set of 18 plan cards and was asked to rank them accordingly to their own perception. The ranks provided by them to these 18 cards were noted down. For each attribute/respondent, part- worth as well as relative importance of each attribute was estimated using conjoint analysis. Similar process carried out for traders-cum-dal millers to identify the relative importance of each attributes by the traders/dal millers.

In this study, the additive conjoint model was used instead of other forms like the interactive and the multiplicative models. The model has been formulated as:

$$Y = \sum_{i=1}^{n} \sum_{j=1}^{m} Vij\ Xij$$

Where,

Y = The consumers overall evaluation of the product alternative

Vij = Part worth associated with 'j' (1, 2, 3,… m) of attributes 'i' (1, 2,…. n)

Xij = Dummy variable representing the preference of the jth level of ith attribute

Additive conjoint model

The additive conjoint model is a widely-used technique in market research to analyze consumer preferences and decision-making processes. It assumes that the overall utility of a product or service is the sum of the utilities associated with its individual attributes. Mathematically, the utility (U) of a product is expressed as:

$U=\beta_1 \times X_1 + \beta_2 \times X_2 + \ldots + \beta_n \times X_n + \epsilon$

Where:

- U is the overall utility of the product
- β1,β2……βn are the part-worth utilities associated with each attribute
- X1,X2…Xn are the levels of each attribute
- ϵ is the error term

Table 1. Attributes and its levels considered by pigeonpea farmers for conjoint analysis

Sl. No.	Attributes	Levels
1	Crop duration	130-150 days 120-130 days
2	Plant height	Medium Short
3	Resistance to	Pod borer Wilt

4	Output price	Rs. 6000-7000 >Rs.7000
5	Yield	6-7 Quintal >7 Quintal
6	Flowering character	Synchronous flowering Non-synchronous flowering

Table 2. Attributes and its levels considered by pigeonpea traders for conjoint analysis

Sl. No.	Attributes	Levels
1	Shape of seed	Round Oval
2	Moisture content	8-10% <8 %
3	Seed coat	Thick Thin
4	Keeping quality	>10 months 6-10 months
5	Raw material price	Rs. 5000-6000 Rs. 4000-5000
6	Recovery (%)	70-80 % >80%

3. RESULTS AND DISCUSSION

3.1 Attributesof pigeonpea varieties mostpreferredbyfarmers in the study area

The decision for adopting pigeonpea varieties in general and TS 3R and GRG 811 in particular in the overall study area is more influenced by the attributes of pigeonpea viz. crop duration, plant height, resistance to pest and diseases, output price, yield levels, flower drop, etc.as mentioned in the Table 1. Hence, an attempt is made to identify the type of preference by the pigeonpea growers.

For every sample farmers of the study area, the part worth was estimated by using OLS regression analysis and the fitness of the model to the individual data was good. The Pearson's rank correlation test values were 0.852 and 0.885 for TS 3R and GRG 811 varieties respectively, and are significant at 1 % level (Table 4). From the Table 3 and Fig. 1 it could be seen that output price and crop duration attributes of both TS 3R and GRG 811 varieties were the deciding factors in their adoption. The output price of TS 3R and GRG 811 varieties were influenced to the extent of 26.75 and 23.59 per cents of relative importance respectively, further farmers expect minimum of Rs.7000 per quintal of pigeonpea with utility values of 1.7756 (TS 3R) and 1.5352 (GRG 811).

Another important attribute elicited by the respondents is height of the plant which has least importance of 7.66 and 9.93 % in TS 3R and GRG 811 growers respectively. Duration of the crop was found to have greater influence accounting for 22.26 (TS 3R) and 22.51 (GRG 811) per cents of relative importance, respondents preferred short duration (120-130 days) varieties with utility value of 1.4775 (TS 3R) and 1.4649 (GRG 811). This might be due to requirement of additional chemical spray and decline in the quality of the produce due to high incidence of pest for long duration varieties.

In case of TS 3R variety grower's, resistance to pest and diseases has greater influence on the farmer's decision next to crop duration accounting for 16.28%. The TS 3R variety with resistance to wilt was most preferred (utility value of 1.0806) compared to pod borer attack which was least preferred (utility value of -1.0806).

Whereas, in case of GRG 811 resistance to pest and diseases has greater influence on the farmer's decision accounting for 11.84 %. The GRG 811 variety with resistance to pod borer was most preferred (utility value of 0.7705) as compared to wilt resistance which was least preferred (utility value of -0.7705) by respondent farmers. The results are on par with Uma *et al*. (2005) and Ajambo *et al*. (2010)[1, 12].

The yield of the variety has the higher relative importance in both GRG 811 (18.81%) and TS 3R (16.13%) varieties. In both the varieties the yield level of more than 7 quintal per acre was most preferred.Further, pigeonpea variety with no flower drop was most preferred by both GRG 811 (utility value of 0.8017) and TS 3R (utility value of 0.7248) growers. It is important to note that during opinion survey the farmers have expressed that flower drop is the major concern which will reduce yield to a greater extent.

Table 3. Attributesof TS 3R and GRG 811 pigeonpea varieties mostpreferredbyfarmers in the overall study area

Sl.No.	Attributes	Levels	TS 3R		GRG 811	
			Utilityvalue	Relativeimportance(%)	Utilityvalue	Relativeimportance(%)
1	Cropduration	130-150days 120-130days	-1.4775 1.4775	22.26	-1.4649 1.4649	23.51
2	Plantheight	Medium Short	-0.5084 0.5084	7.66	-0.6462 0.6462	8.93
3	Resistanceto	Pod borer Wilt	-1.0806 1.0806	16.24	0.7705 -0.7705	11.64
4	Outputprice	Rs. 6000-7000 > Rs. 7000	-1.7756 1.7756	26.79	-1.5352 1.5352	24.79
5	Yield	6-7 Qtl. >7 Qtl.	-1.0706 1.0706	16.13	-1.2892 1.2892	18.81
6	Flowering character	Synchronous flowering Non-synchronous flowering	0.7248 -0.7248	10.92	0.8017 -0.8017	12.32

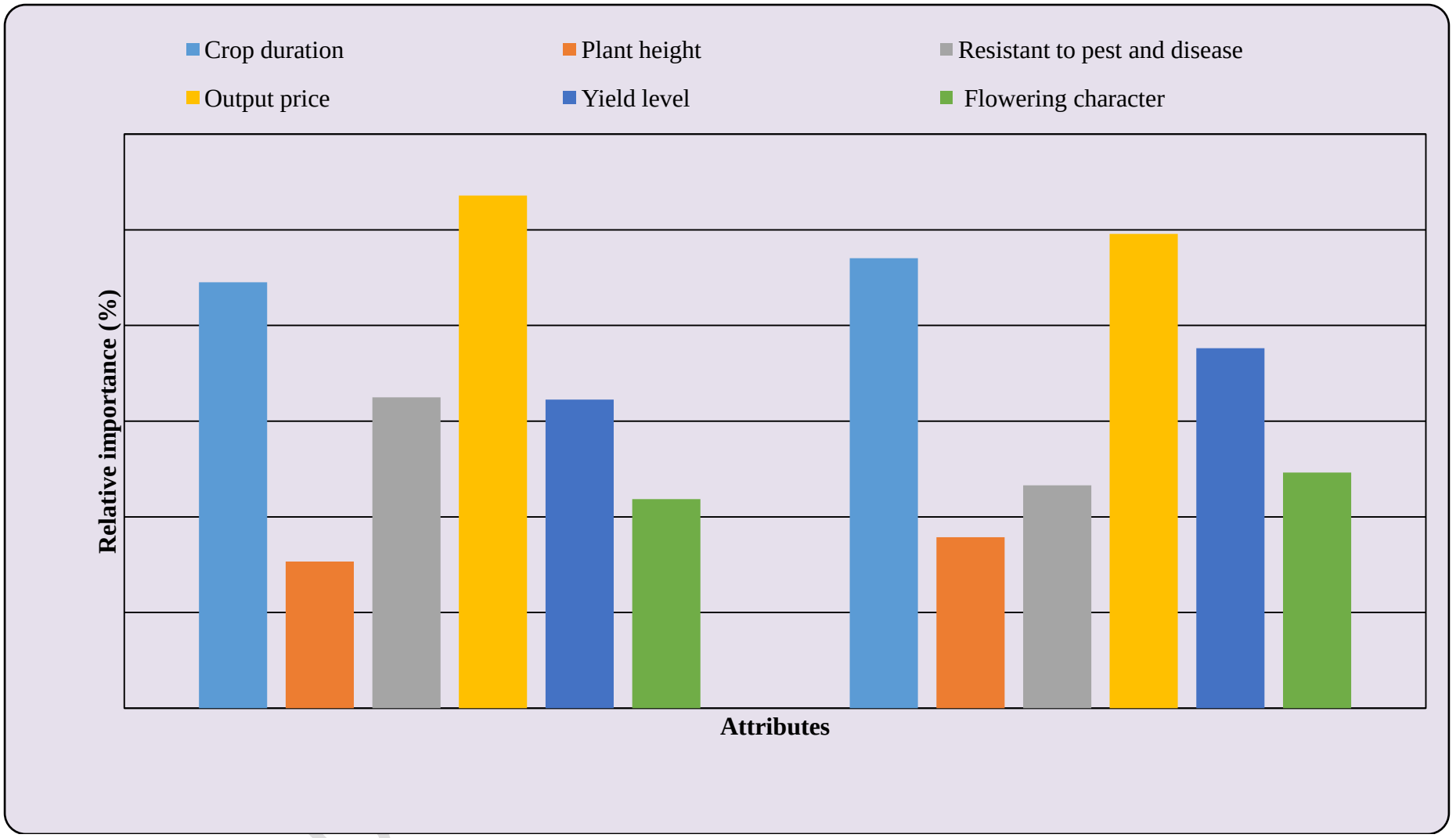

Fig. 1 Relative importance of pigeonpea attributes preferred by farmers

Table 4.Correlation betweenfarmerspreferenceof TS 3R and GRG 811 pigeonpea varieties in the overall study area.

Particulars	Correlationco-efficient	
	TS 3R	GRG 811
Pearson'srankcorrelation	0.852*	0.885*
Kendall'staucorrelation	0.724*	0.819*
Constant	0.866	0.825

Note: *Significantat 1%level

The output price and crop duration were the most preferred attributes in both varieties. As the better market price and short duration of the crop fetches higher returns to the farmers. In case of TS 3R pigeonpea variety, the farmers preferred resistance to wilt disease followed by flower drop which is considered most important and is beyond their control. In both the varieties farmers prefer the yield level minimum 6-7 quintal per acre with output priced more than Rs. 7000. This indicates that farmers preferred the variety which should give optimum yield and should fetch better price in the market. The results are at par with Parthasarathy *et al.* (1991), Sharma *et al*. (2017) and Dinesh, T.M, (2015)[6, 2, 9].

3.2 Attributes of pigeonpea varieties most preferred by the traders

The decision of traders in the purchase of particular variety of pigeonpea is highly influenced by its attributes namely shape of the seed, moisture content, thickness of seed coat, keeping quality, raw material price, recovery percentage, etc.as mentioned in the Table 2. Hence, an attempt is made to identify the type of preference that traders have towards the quality parameters.

The cards developed for conjoint analysis were administered to pigeonpea traders in the study area according to the sampling procedure. The traders were asked to score the cards displayed. Table 5 and Fig. 2 represents the average partworth's and the relative importance of the attributes of the pigeonpea varieties in the study area. For each traders of the study area, the part worth was estimated by using OLS regression analysis. The fitness of the model to the individual data was good and Pearson's rank correlation test value was 0.869, significant at 1 % level (Table 6).

It is evident from the Table 5 out of six attributes considered for the study, moisture content and thickness of seed coat were highly influenced in deciding trader's preference for a particular quality/variety of pigeonpea for milling. Moisture content of the grains was found to be highly influencing attribute which accounted for relative importance of 27.32%. The grains with less than 8 % moisture content were preferred most (utility value of 3.125) and grains with more than 8 % moisture content were least preferred (utility value of -3.125). The raw material price does not matter for the traders to purchase pigeonpea which has the least importance of 5.04%.

Thickness of the seed coat was found to have strong influence on the traders buying decision with relative importance of 20.04 % of relative importance. Thin seed coat was most preferred (utility value of 2.2922) and thick seed coat was least preferred (utility value of -2.2922). Similarly recovery percentage of the dal also have great influence on the traders buying decision next to thickness of seed coat. It accounts for relative importance of 18.73%. The higher recovery rate of more than 80% was most preferred (utility value of 2.1420) than the recovery rate of 70 to 80% (utility value of -2.1420).

Table 5. Attributes of pigeonpea varieties most preferred by traders in the overall study area

Sl.No.	Attributes	Levels	Utility	Relativeimportance(%)
1	Shape of seed	Round Oval	1.6254 -1.6254	14.21
2	Moisturecontent	8-10% < 8 %	-3.125 3.125	27.32
3	Seed coat	Thick Thin	- 2.2922 2.2922	20.04
4	Keeping quality	>10 Months 6-10 Months	1.6654 -1.6654	14.56
5	Raw material price	Rs. 5000-6000 Rs. 4000-5000	0.5765 -0.5765	5.04
6	Recovery (%)	70-80 % >80%	-2.1420 2.1420	18.73

The pigeonpea dal having more than 10 months keeping quality were most preferred (utility value of 1.6654) and the dal having 6 to 10 months keeping quality were least preferred (utility value of -1.6654) by the traders. The keeping quality of dal have the relative importance of 14.56%. Further, the shape of the seed have the relative importance of 14.21% and traders prefer round shape grains most (utility value of 1.6254) and the oval shape seeds were preferred least (utility value of -1.6254). The results are in line with Karuri *et al.* (2000) and Kamanga (2000) [5, 4].

Majority of the pigeonpea traders preferred the variety having moisture content less than 8%. This might be due to difficulties in the storage of produce, quality deterioration and also weight loss of the grain. Seed coat is another important attribute which holds more relative importance wherein thin seed coat is most preferred because of quality and better recovery percentage. Further, thin seed coat makes difficult to detach dal from the seed cover which results lower recovery percentage. Seed shape is another important factor which fetches better price and traders preferred round shaped seeds over the oval shape because round shaped seeds will not break on the roller while making dal, which will reduce the second quality dal production. The traders had given least importance to price of the raw material as they were operating in a perfect market condition so they cannot influence on the price of the raw material. The results are in line with Parthasarathy *et al.* (1991) and Dinesh, (2015)[6, 2].

Table 6. Correlation betweentraderspreferenceof pigeonpea varieties in the overall study area

Particulars	Correlationco-efficient
Pearson'srankcorrelation	0.869*
Kendall'staucorrelation	0.741*
Constant	0.858

Note: *Significantat 1%level

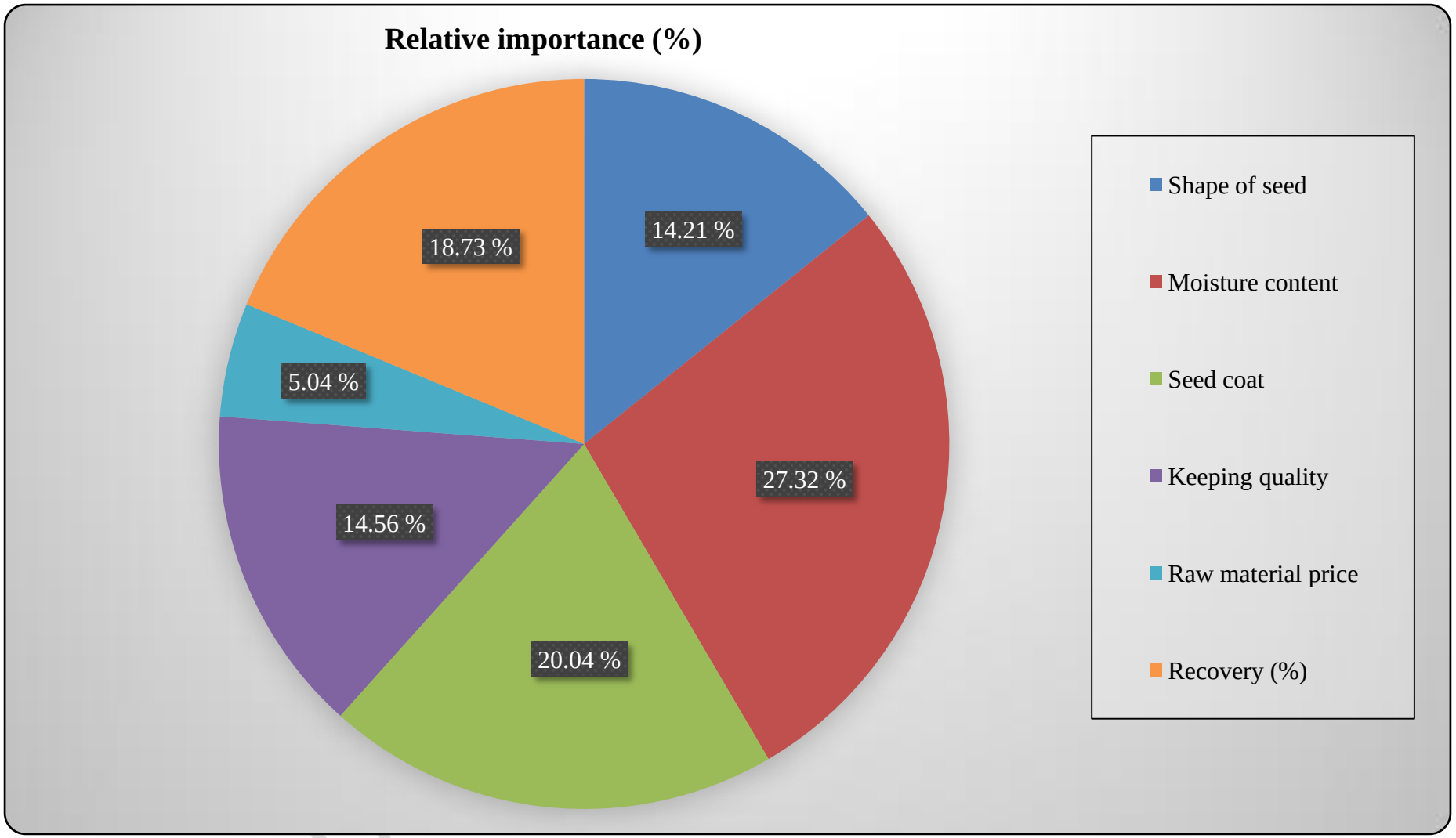

Fig. 2 Relative importance of pigeonpea attributes preferred by traders

4. CONCLUSION

The study conducted in the Kalyana Karnataka region unveils the preferences of pigeonpea farmers and traders, emphasizing the significance of aligning variety attributes with market demands. Farmers prioritize shorter crop durations, higher output prices, and resistance to pests and diseases, while traders prioritize moisture content, seed coat thickness, and recovery percentage for milling. These findings underscore the need for policymakers to promote pigeonpea varieties that meet market preferences, fostering economic growth and sustainability. Initiatives aimed at breeding varieties with desired attributes and enhancing market access for traders can contribute to the overall development of the pigeonpea sector in the region, ensuring better returns for farmers and efficient milling processes for traders.

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