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Farmers preferences of groundnut varieties and their varietal attributes – A farm level analysis

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ABSTRACT

Indian groundnuts are available in different varieties, and the awareness and concern for quality and attributes is growing steadily among groundnut growers and processors. Hence, understanding the farmers' tastes and preferences in selecting groundnut varieties is essential for the successful adoption of groundnut varieties. This study was taken up with the objective of assessing the farmers' preferences of groundnut varieties and their attributes among farming community in Telangana State as the traits and performance of the varieties is crucial in selection for cultivation. For this purpose of the same, a Groundnut Preference Index (GPI) was developed to rank varieties as per the preferences of the farmers based on traits like pod yield, kernel yield, oil content, shelling percentage, and stress tolerance. The results revealed a clear preference for the K6 variety, which ranked highest with a GPI score of 1034.34, owing to its superior pod and kernel yield, oil content, and resistance to biotic stresses. Tag 24 and Kadiri Lepakshi also performed well but did not surpass K6 in overall performance. Farmers prioritized traits directly linked to productivity and profitability, such as pod yield, kernel yield, and oil content, while resilience traits like drought tolerance and pest resistance ranked lower. These insights emphasized the need for breeding programs to focus on high-yielding, profitable varieties, while extension services must highlight the economic benefits of adopting those varieties by the farming community.

Keywords: *Groundnut varieties, farmers' preferences, farmers' awareness, Groundnut Preference Index (GPI) and varietal traits*

1. Introduction

Groundnut is a key crop grown across most tropical and subtropical regions globally, with an estimated total production of 51.32 million tonnes (mt). India ranks as the second-largest producer of groundnut, contributing 7.10 mt, accounting for 14 percent of global production in 2023-24, followed by China 19 mt, which makes up 37 percent of global output (11). In Telangana, groundnut was cultivated in 1.03 lakh hectares during 2022-23, yielding 2.52 lakh tonnes with an impressive productivity of 3,491 kg per hectare (3). Despite Telangana's high productivity, substantial cultivation area, and promising export potential, these factors have not translated into proportionate economic returns for farmers. Farmers' preference regarding agricultural technologies is a key factor in determining whether they adopt or reject innovations. Understanding these preferences enhances the effectiveness of extension activities and improves the impact of research and development efforts. By aligning research outputs with farmers' needs, the agricultural system can develop a diverse range of varieties that address multiple farmer concerns (6). Currently, India has 291 officially notified varieties of groundnut (9). Despite the wide range of options, farmer perceptions play a critical role in determining the varieties that were ultimately selected and cultivated. To improve the adoption rates of new groundnut varieties, it is essential to identify the specific traits of groundnut varieties that farmers prioritize.

In this context, the Groundnut Preference Index (GPI) was developed and used to evaluate the traits that farmers considered as most important when selecting groundnut varieties, providing insights that can guide future breeding and extension efforts (10).

The Groundnut Preference Index (GPI) is a tool developed to evaluate and rank groundnut varieties based on essential agronomic traits, including pod yield, kernel yield, oil content, shelling percentage, and resistance to biotic and abiotic stresses. As a critical oilseed crop with global significance, groundnut contributes substantially to the agricultural economies of various countries. By assigning specific weights to these traits, the GPI generates an aggregated score that reflects each variety's overall performance and suitability for cultivation. This index serves as a valuable resource for farmers, researchers, and policymakers, enabling them to make informed decisions regarding the selection and adoption of groundnut varieties based on performance and adaptability.

2. Materials and Methods

The study employed an *ex-post-facto* research design.To assess the preferences and adoption of groundnut varieties among farmers this research was conducted in the five major groundnut-growing districts of Telangana, namely Mahabubnagar, Wanaparthy, Nagarkurnool, Jogulamba Gadwal, and Narayanpet (2). The study was conducted during the 2023-24 agricultural seasons. A multi-stage sampling procedure was used to select respondents. First, two mandals from each district were chosen based on the largest area under groundnut cultivation, resulting in a total of 10 mandals. Consequently, two villages from each selected mandal were chosen. Finally, six farmers who were involved in the Cluster Front Line Demonstrations from each village were selected randomly

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using random number tables, leading to a total of 120 respondents. Data was collected through a pre-tested, standardized, and well-structured interview schedule designed to capture farmers' insights and preferences regarding groundnut varieties.

Twenty important traits were identified through a literature review and in consultations with groundnut experts and breeders to determine farmers' preferences for groundnut varieties based on key varietal attributes. A weighted scoring method was employed to rank the relative importance of each trait. The weighted scores were determined by consulting a group of thirty farmers of non-sample areas (excluding study respondents) and nine scientists from three institutions: ICAR-IIOR, ICRISAT, and PJTSAU. Farmers who participated in focus group discussions rated the significance of each trait based on their perceived importance for groundnut production and profit. All the farmers and scientists responded on a scale of 1 to 10 with 1 being least preferred and 10 being highly preferred based on their knowledge and expertise in their respective fields. Based on these ratings, weighted scores were calculated, and the top ten traits with the highest scores were selected for the study. These traits were then presented to the respondent farmers, who rated them on a 5-point continuum. The final list of traits, ranked by importance, included pod yield, kernel yield, oil content, shelling percentage, hundred kernel test weight, resistance to late leaf spot, tolerance to sucking pests, drought tolerance, tolerance to *Aspergillus flavus*, and resistance to collar rot. The score of each trait of a particular variety was added across the respondents to obtain the total score of each trait of a particular variety. These total scores were multiplied with the weighted scores to obtain the total weighted scores of each trait of a particular variety. These total weighted scores of all the traits of a variety.

Table 1: Rank-wise selected traits along with their weightage and weighted score

S. No	Traits	Weightage	Weighted score	Rank
1	Kernel yield	0.072	10.833	1
2	Kernel test weight	0.068	9.572	2
3	Oil content	0.065	8.905	3
4	Pod yield	0.064	8.517	4
5	Shelling percentage	0.060	7.523	5
6	Tolerant to drought	0.057	6.818	6
7	Resistance to late leaf spot	0.056	6.591	7
8	Tolerance to sucking pests	0.054	6.039	8
9	Tolerance to *Aspergillus flavus*	0.052	5.720	9
10	Tolerance to collar rot	0.052	5.512	10

were added to obtain the grand score of each variety. These grand scores when divided by the number of respondents Grand Mean Scores (GMS) were obtained. These GMS directly depict the GPI score for which the rankings were assigned.The preferences of the 120 respondent farmers was assessed using the Groundnut Preference Index (GPI). The data collected from the survey was analyzed using the GPI method.

$$\mathbf{GPI} = \frac{\left(\sum_{k=1}^{m}\sum_{j=1}^{10}\sum_{i=1}^{n} W_{ij}X_{ijk}\right)}{\sum_{k=1}^{m}}$$

Whereas,
GPI= Groundnut Preference Index,
W_{ij}= Weight of the j^{th} characteristic of the i^{th} Groundnut varietal trait,
X_{ijk}= Farmers' preference score assigned towards j^{th} characteristics of i^{th} Groundnut varietal trait by k^{th} farmer,
i= Groundnut varietal traits ranging from 1 to n,
j=Characteristics of Groundnut variety ranging from 1 to 10,
k= Number of respondent farmers ranging from 1 to m.

3. Results and Discussion

3.1 Documentation of groundnut varieties

The groundnut varieties cultivated in the study area were documented in consultation with PJTSAU scientists, Department of Agriculture Officials, and farmers. The varieties released and promoted by the university were carefully reviewed. It was recorded that varieties *viz*. K6, *Kadiri Lepakshi*, K9, and Tag 24 were found to be majorly adopted in the study area.

3.2 Preference ranking of groundnut varietal traits by the respondent farmers

Table 3.1 revealed the farmers' preference rankings for various traits in different groundnut varieties, highlighting key justifications for their choices. K6 ranked first and second for pod yield and kernel yield respectively, indicating its superior productivity, which is crucial for maximizing harvest outputs. *Kadiri lepakshi* was highly valued for kernel yield and pod yield reflecting its efficiency in producing high-quality seeds. K9 excelled in oil content and kernel yield, as it was preferred choice for oil production. Tag-24 also ranked first and second for oil content and pod yield respectively, directly reflecting high kernel weight character which ranked third.

Table 2: Preference Ranking of traits of documented groundnut varieties by the respondent farmers (n=120)

Varietal trait	Weightage	Ranking of traits in each variety			
		K6	Kadiri Lepakshi	K9	Tag 24
Pod yield	0.064	1	2	4	2
Kernel yield	0.072	2	1	2	1
oil content	0.065	3	4	1	4
Shelling percentage	0.060	7	5	5	5
Kernel test weight	0.068	4	3	3	3
Resistance to late leaf spot	0.056	6	7	6	6
Tolerance to sucking pests	0.054	8	8	7	8
Tolerance to drought	0.057	5	6	8	7
Tolerance to Aspergillus flavus	0.052	9	10	10	9
Tolerance to collar rot	0.052	10	9	9	10

While traits such as resistance to late leaf spot and tolerance to sucking pests, drought, *Aspergillus flavus*, and collar rot had lower rankings across all varieties, they were found to be significant for maintaining crop health and minimizing crop losses. The highest ranking to K6 with respect to critical yield and quality traits justified its preference among farmers, as these traits directly impact profitability and crop success. Overall, productivity and quality traits were prioritized, with K6 being the top choice due to its comprehensive performance across these essential attributes. These findings were in line with the results of (1), (8) and. (7) who concluded that the pod yield, haulm yield, weight of the pod and adaptation to environmental stresses as the most important traits preferred by farmers.

3.3 Preference ranking of groundnut varieties by farmers

According to the results presented in table 3.2, the variety K6 ranked highest with a GPI score of 1034.34, indicating its superior performance across multiple traits. This variety was particularly noted for its high pod yield (173.263), kernel yield (155.935), and oil content (127.389).

It also demonstrated substantial resistance to late leaf spot and other biotic stresses, making it a preferred choice among farmers. Tag-24, with a GPI score of 240.421, ranked second, followed by *Kadiri Lepakshi* and K9. The results related to the K9 variety were in contradiction with the findings of (6) and the results related to the K6 variety were in line with the findings of (7).

The high ranking of K6 can be attributed to its excellent productivity traits and resilience against pests and diseases. Tag 24's preference was driven by its consistency in yield and high kernel weight, although not as high as K6. Varieties like *Kadiri lepakshi* had lower GPI, still showed acceptable performance in specific traits, which made it suitable for certain conditions or preferences.

Overall, the preference analysis revealed that farmers majorly prioritized traits like pod yield followed by kernel yield, oil content, high shelling percentage, and more weight of kernel while selecting groundnut varieties. These insights are crucial for breeders and policymakers aiming to develop and promote varieties that meet the practical needs and preferences of farmers.

Table 3: Preferential ranking of groundnut varieties by the respondent farmers ***(n=120)***

Varietal trait	Weightage	Varieties			
		K6	Kadiri Lepakshi	K9	Tag 24
Pod yield	0.064	173.26	4.744833	0.13944	35.32577
Kernel yield	0.072	155.935	4.747118	0.15228	33.88336
oil content	0.065	127.389	2.85039	0.219938	32.7355
Shelling percentage	0.060	93.9204	2.840693	0.073373	27.74115
Kernel test weight	0.068	107	2.92815	0.1446	32.1745
Resistance to late leaf spot	0.056	99.0236	2.51262	0.069795	22.05867
Tolerance to sucking pests	0.054	83.7212	2.20158	0.061155	17.90558
Tolerance to drought	0.057	107.581	2.785813	0.043528	18.67721
Tolerance to Aspergillus flavus	0.052	40.5784	0.77064	0.012667	10.36083
Tolerance to collar rot	0.052	45.552	1.1907	0.026133	9.558675
G P I		1034.34	27.57254	0.942908	240.4212
Rank		1	3	4	2

4. Conclusion

The results of this study revealed that farmers in Telangana state exhibited a clear preference for groundnut varieties that offer superior productivity and quality traits, particularly focusing on pod yield, kernel yield, oil content, and resistance to biotic stresses like late leaf spot. Among the documented varieties, K6 emerged as the most preferred due to its excellent performance across multiple critical traits, particularly in terms of pod yield, kernel yield, and oil content. Tag 24 and *Kadiri Lepakshi* also ranked highly but did not match the overall performance of K6. Traits like tolerance to drought, sucking pests, *Aspergillus flavus*, and collar rot, while important for crop resilience, ranked lower in farmers' preferences. These findings suggested that the farmers prioritized traits that are directly linked to productivity and profitability, underscoring the need to align breeding efforts with these preferences to ensure widespread adoption of new varieties.

Based on these insights, a multi-faceted strategy should be developed to promote the adoption of groundnut varieties that meet farmers' key preferences. Breeding programs should focus on enhancing traits that significantly impact productivity, such as pod yield, kernel yield, and oil content, while also improving resistance to major pests and diseases. In addition, targeted extension services should emphasize educating farmers about the long-term benefits of varieties that offer not only high yields but also enhanced resistance to environmental stresses and diseases. Policymakers and researchers should work together to ensure that new varieties are accessible and affordable, while extension agencies should focus on demonstrating the economic benefits of adopting varieties like K6 to maximize farmer acceptance and profitability.

Future scope of the study: The identified traits of the Ground nut varieties will help in understanding the importance in selection of varieties by the farming community.

Conflict of interest: There is no conflict of interest.

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