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Extent of adoption of pigeonpea technologies and production challenges of pigeonpea farming in Kalyana-Karnataka region

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Abstract

This study investigates the adoption levels of pigeonpea technologies among farmers in the Kalyana-Karnataka region, particularly focusing on the TS-3R and GRG-811 varieties. Through detailed examination, we assess the extent of adoption across various production, protection, and water management practices associated with pigeonpea cultivation. Additionally, we identify and rank the constraints impeding technology adoption, encompassing production, marketing, and technical challenges. Our findings underscore the prevalent adoption patterns and shed light on key barriers faced by farmers. The study emphasizes the urgent need to address these constraints to facilitate wider adoption of improved pigeonpea technologies. By elucidating both adoption levels and associated constraints, this research offers valuable insights for policymakers and stakeholders to enhance pigeonpea production in the region.

Keywords: Technologies, adoption, resources, constraints, varieties, TS-3R and GRG-811

Introduction

Pigeonpea, also known as redgram, is a significant crop in warm regions. It's the second most important pulse crop after bengalgram. It's widely grown by small farmers in developing countries. Pigeonpea originally comes from South India. In India, redgram is the second most produced pulse crop. In the year 2017-18, India produced about 4.25 million tonnes of redgram, covering an area of about 4.43 million hectares. Maharashtra, Madhya Pradesh, and Karnataka are the top three states producing redgram (B. Rajendrer *et al.* 2018) [9]. Nutritionally, redgram is quite nutritious. In every 100 grams of redgram, there are around 22.40 grams of protein, 48.19 grams of carbohydrates, and 2.74 grams of fat. Plus, it contains important minerals like calcium and zinc (Taalari *et al.* 2018) [13]. In Karnataka, pigeonpea is grown in an area of 8.9 lakh hectares with a production of 8.2 lakh tonnes and a productivity of 1150 kg/ha. The major pigeonpea growing districts in Karnataka include Kalaburagi, Vijayapur, Bidar, Yadgir, Bellary, Bagalkot, and Raichur. It's mainly cultivated in the northern parts of the state, particularly in the Kalyana-Karnataka region, where Kalaburagi, Bidar, and Yadgir districts contribute significantly to the total production of the state.

Understanding the extent of adoption of pigeonpea technologies by farmers is essential for assessing the effectiveness of agricultural interventions and identifying areas for improvement. In this study, various production, protection, and water management technologies developed by the University of Agricultural Sciences, Raichur were evaluated to determine their adoption levels among farmers in the Kalyan-Karnataka region. The findings revealed that a significant proportion of sample farmers demonstrated a medium level of adoption of recommended practices, indicating a willingness to adopt technological advancements. Notably, the study identified specific technologies such as timely sowing, recommended doses of fertilizer application, and seed treatment that were widely adopted by farmers, showcasing their recognition of the benefits associated with these practices.

Recognition of the constraints faced by farmers in pigeonpea production is crucial for optimizing production and maximizing income. Through an opinion survey utilizing the Garette ranking technique, farmers' perceptions regarding these constraints were revealed. The study categorized the identified constraints into three main categories: production constraints, marketing constraints, and technical constraints. Production constraints, as indicated by the sample farmers, encompassed issues such as the non-availability of required quantities of farmyard manure (FYM) and labour shortages coupled with high wage rates. Marketing constraints included challenges like low prices for produce and price volatility, while technical constraints comprised issues like misinformation from input dealers and a lack of knowledge about improved agricultural practices. Understanding and addressing these constraints are vital for enhancing pigeonpea production and ensuring the welfare of farmers.

Materials and Methods

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 percent 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 RSK, KVK and 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.

Analytical tools

Descriptive statistics

The sample farmers who adopted technologies were scored with one and those who do not have adopted the technologies scored as zero. In such a manner, the adoption score for all recommended pigeonpea technologies for an individual farmer was worked out. Then calculated the number of technologies adopted by each pigeonpea sample farmer. The mean and standard deviation are worked out for total number of technologies adopted by all the sample farmers. Then classified farmers into low, medium and high adopters using following formula.

$< (\bar{X} - SD)$ = Low level of adoption

$(\bar{X} \pm SD)$ = Medium level of adoption

$> (\bar{X} + SD))$ = High level of adoption

Garrett's ranking technique

The constraints faced by the sample farmers during adoption of pigeonpea technologies were ranked by using Garrett's ranking technique. As per this method, respondents were asked constraints that they were faced in adoption of pigeonpea technologies. Depending upon extent of constraints faced by them rankings were assigned separately to each constraint. Likewise, ranks were assigned to different frequency of various factors/parameters. The results of such rankings were converted into score value by using following formula.

$$\text{Per cent position} = \frac{100 * (R_{ij} - 0.5)}{N_j}$$

Where, R_{ij} = Rank given for the i^{th} factor by j^{th} respondent.
N_j = Number of factors ranked by the j^{th} respondent.
The percent position of each rank was converted to scores by referring to tables given by Garret and Woodworth (1969) [6]. Then for each factor, the scores of individual respondents were summed up and divided by the total number of respondents for whom scores were gathered. The mean scores for all the factors were ranked.

Results and Discussion

Extent of adoption of pigeonpea technology by farmers

Distribution of sample farmers based on their adoption level of pigeonpea technologies

There are many technologies developed by the University of Agricultural Sciences, Raichur for the production of agricultural crops in the Kalyan-Karnataka region during last 12 years. Some of the technologies developed by UASR are become very popular in general and pulse crops in particular. Keeping this in mind researcher made attempt to evaluate important technologies adopted by the farmers.

There were about 10 important technologies with respect to pigeonpea cultivation. These technologies were classified into production, protection and water management technologies. Sowing time, RDF application, seed rate, seed treatement, nipping and intercultivation were major practices with respect to production. Insect pest management and disease management were major practices with respect to protection. Whereas, construction of drainage and establishment of ridges and furrows were major practices in case of water management in pigeonpea cultivation.

Table 1 represents the data with respect to overall adoption level of the pigeonpea technologies by the sample farmers. The findings of the table revealed that the majority of the sample farmers (51.66%) had medium level of adoption (5 to 8 technologies) of various recommended practices. Whereas, 30.83 percent of the sample farmers had low level of adoption (< 5 technologies) and 17.51 percent of sample farmers had high level of adoption (> 8 technologies) of various recommended practices. Out of total 120 sample farmers, 37 farmers were under low adopter category, 62 farmers were under medium adopter category and 21 farmers were under high adopter category.

The highest percentage of pigeonpea growers had medium level adoption of various recommended practices followed by low level of adoption and high level of adoption. This might be due to the fact that most of the medium adopters were found in the age group of 30 to 50 years and had formal education up to primary level. They also had good extension contact. This made them to adopt recommended technologies of pigeonpea to the greater extent. Similar results were quoted in their studies by Beena *et al.* (2014) [2], Choudhary *et al.* (2017) [4] and Brunda, (2018) [3]. They reported in their studies that the majority of farmers who adopted different crop technologies were found in medium adopter category. Therefore, KVK and other extension agencies need to create awareness on various technologies developed by University of Agricultural Sciences, Raichur.

Table 1: Distribution of pigeonpea growers according to their adoption level of pigeonpea technologies n=120

Sl. No.	Level of adoption	Limit	No. of farmers	Percent
1	Low	Below (mean - SD)	37	30.83
2	Medium	From (mean - SD) to (mean + SD)	62	51.66
3	High	Above (mean +SD)	21	17.51
	Total		120	100.00

Extent of adoption of pigeonpea technologies by sample farmers

The data with respect to the variety wise adoption of improved technologies of pigeonpea cultivation is presented in Table 2 and Fig 1 The findings of the study revealed that cent percent of respondent farmers of TS 3R and GRG 811 pigeonpea variety growers were practiced timely sowing (100%). This might be due to awareness about reduction in the yield of late sown pigeonpea varieties. It is also evident from the table that the recommended doses of fertilizer application (86.66%), seed treatment (66.66%) and nipping (76.66%) practices were highly adopted in GRG 811 growers compared to recommended doses of fertilizer application (41.66%), seed treatment (65.00%) and nipping (43.33%) practices of TS 3R growers. This is due to higher response of GRG 811 varieties for recommended doses of fertilizer application and nipping which results higher yield. However, seed rate (71.66%) and intercultivation (68.33%) practices adopted in case of TS 3R growers were relatively higher compared to seed rate (65.00%) and intercultivation (63.33%) practices of GRG 811 growers.

In case of adoption of protection technologies, insect pest management (70.00%) was highest in case of GRG 811 growers compared to TS 3R (46.66%) growers. Whereas, large number of farmers adopted disease management practice in case of TS 3R growers (78.33%) compared to GRG 811 growers (61.66). This was due to high incidence of pest in case of GRG 811 and highly susceptible to wilt and other soil borne diseases in case of TS 3R. Therefore farmers have adopted timely spraying of pesticides in both GRG 811 and TS 3R growing farmers and were aware about severity of wilt disease in case same variety is grown on the same land for many years. Similarly in case of adoption of water management practices like construction of drainage (55.00%) and establishment of ridges and furrows (80.00%) were highly adopted by GRG 811 growers compared to construction of drainage (40.00%) and establishment of ridges and furrows (73.33%) of TS 3R growers.

It can be inferred that cent percent of adoption of technologies were found in case of sowing time by both TS 3R and GRG 811 growers. Similar results were reported by Islam *et al* (2013) [7], Dhayal and Mehta (2015) [5] and Brunda, (2018) [3], wherein majority of farmers who adopted the recommended technologies were found to be more with respect to time of sowing. The highest percent of adoption in TS 3R variety cultivators were seed rate and intercultivation. These findings are in conformity with findings of Patel *et al*. (2016) [8] who reported that 96.22 percent and 85.55 percent mean score was recorded for tillage and inter cultivation and ranked first and second, respectively in adoption of groundnut production technologies in Banaskantha district in North Gujarat. Further, highest percent of adoption of nipping and RDF application technologies were noticed in the study.

Table 2: Extent of adoption of pigeonpea technologies by farmers in the study area

Sl. No.	Technologies	Extent of adoption			
		TS 3R (N=60)	% age	GRG 811 (N=60)	% age
I	**Production technologies**				
1	Sowing time	60	100.00	60	100.00
2	RDF application	25	41.66	52	86.66
3	Seed rate	43	71.66	39	65.00
4	Seed treatement	39	65.00	40	66.66
5	Nipping	26	43.33	46	76.66
6	Intercultivation	41	68.33	38	63.33
II	**Protection technologies**				
7	Insect pest management	28	46.66	42	70.00
8	Disease management	47	78.33	37	61.66
III	**Water management**				
9	Drainage	24	40.00	33	55.00
10	Ridges/Furrows	44	73.33	48	80.00

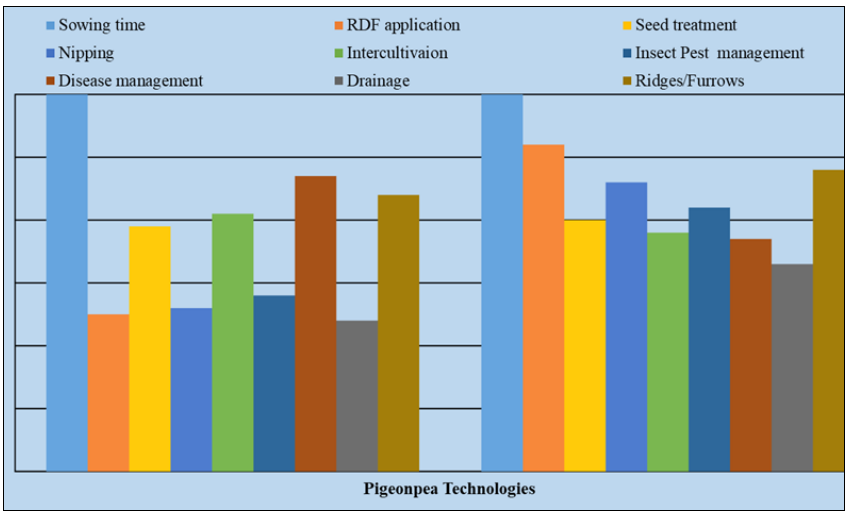

Fig 1: Adoption level of pigeonpea technologies by TS 3R and GRG 811 variety cultivating farmers

Constraints faced by the farmers in pigeonpea production

It is essential to study the major constraints faced by the farmers in pigeonpea production. The problems opined by the farmers to be identified, sorted out and evaluated as the farmers hold them as impeding factors for optimising production and maximisation of their income. Therefore, an opinion survey was carried out to reveal the perceptions of farmers about constraints in pigeonpea production

In order to identify the constraints faced by the farmers in pigeonpea production, Garette ranking technique was used and results are presented in Table 3. The ranking was done for constraints faced by sample farmers. The constraints faced by the farmers were sub divided into production constraints, marketing constraints and technical constraints.

Table 3: Production constraints in adoption of pigeonpea technologies at farm level

Sl. No.	Particulars	Garret's Score	Rank
1	Non availability of required quantity of FYM	68.06	I
2	Non availability of labour and high wage rate	64.60	II
3	Lack of knowledge about improved technologies	60.64	III
4	Non availability of improved seeds	59.27	IV
5	High cost of improved seed	59.18	V
6	High cost of fertilizers	54.79	VI
7	Resistance of pod borer against insecticides	39.70	VII
8	Non availability of bio fertilizers and biopesticides on time	36.49	VIII
9	Lack of knowledge about the use of biofertilizers	31.01	IX
10	Low price for machine harvested produce	10.27	X

In production constraints (Table 3), sample farmers stated the top most constraint as non-availability of required quantity of FYM with Garret score of 68.06. Similarly, non-availability of labour and high wage rate (Garret score 64.60) as second most important constraint faced by them. The other constraints faced by the sample farmers were lack of knowledge about improved technologies (III Rank), non-availability of improved seeds (IV Rank), high cost of improved seed (V Rank), high cost of fertilizers (VI Rank), resistance of pod borer against insecticides (VII Rank), non-availability of bio fertilizers and biopesticides on time (VIII Rank), lack of knowledge about the use of biofertilizers (IX Rank) and low price for machine harvested produce (X Rank). The results are in line with Balappa Shivaraya (1998) [1] who conducted study on resource use efficiency in redgram under integrated pest management technology in Gulbarga district.

Table 4: Marketing constraints in adoption of pigeonpea technologies at farm level

Sl. No.	Particulars	Garret's Score	Rank
1	Low Price for produce	63.39	I
2	Price volatility	62.19	II
3	High rate of interest for credit	57.83	III
4	Lack of marketing information	55.81	IV
5	High cost of transportation	39.98	V
6	Lack of processing facility	39.54	VI
7	Absence of cooperative marketing organization	28.40	VII
8	Limited quantity purchase of tur by pulse board	19.83	VIII
9	Non availability of sufficient credit	17.98	IX

From the Table 4 we can recognise that, Low price for produce (Garret score 63.39) and high price volatality (Garret score 62.19) were the top most marketing constraints faced by the sample farmers (Table 4). The other marketing constraints faced by the sample farmers were high rate of interest for credit (III Rank), lack of marketing information (IV Rank), high cost of transportation (V Rank), lack of processing facility (VI Rank), absence of cooperative marketing organization (VII Rank), limited quantity purchase of tur by pulse board (VIII Rank) and non-availability of sufficient credit (IX Rank). The findings of the study are in line with Sani *et al.* (2010) [10] and Vinayaka, (2015) [14] who conducted study on resource use efficiency in redgram production in Karnataka.

Table 5: Technical constraints in adoption of pigeonpea technologies at farm level

Sl. No.	Particulars	Garret's Score	Rank
1	Mislead by input dealers regarding fertilizer and plant protection chemicals application	65.15	I
2	Lack of knowledge regarding improved agrochemical practices	63.36	II
3	Lack of knowledge about insect pest & disease control	59.55	III
4	Couldn't plan in advance about the incidence & application of inputs	58.97	IV
5	Lack of knowledge on location specific improved varieties of pigeonpea	54.72	V
6	Lack of knowledge about seed treatment	53.46	VI
7	Not able to contact extension agencies at the time of necessity	45.80	VII
8	Inability to attend demonstrations & training programmes	30.95	VIII

From the Table 5, with respect to technical constraints, sample farmers stated first constraint as mislead by input dealers regarding fertilizer and plant protection chemicals application (Garret score 65.15) followed by lack of knowledge regarding improved agrochemical practices (Garret score 63.36). Other technical constraints opined by the sample farmers are lack of knowledge about insect pest and disease control (III Rank), farmers couldn't plan in advance about the incidence and application of inputs (IV Rank), lack of knowledge on location specific improved varieties of pigeonpea (V Rank), lack of knowledge about seed treatement (VI Rank), farmers are not able to contact extension agencies at the time of necessity (VII Rank) and farmers are unable to attend demonstrations and training programmes (VIII Rank). The results of the study are in line with Brunda (2018) [3], who conducted study on constraints faced by the farmers in adoption of bengalgram technologies developed by UASR.

Conclusion

Pigeonpea holds significant agricultural importance in the Kalyana-Karnataka region, where it is widely cultivated by small farmers. The evaluation of pigeonpea technologies developed by the University of Agricultural Sciences, Raichur, reveals a promising level of adoption among farmers, with notable uptake of recommended practices such as timely sowing, fertilizer application, and seed treatment, indicating their willingness to embrace technological advancements. However, alongside this adoption, various constraints in pigeonpea production hinder optimal productivity, including the non-availability of farmyard manure, labour shortages with high wage rates, low prices for produce, price volatility, misinformation, and a lack of knowledge about improved agricultural practices. To maximize pigeonpea production in the region, addressing these constraints is imperative through targeted interventions aimed at improving access to inputs, alleviating labour shortages, stabilizing market conditions, and enhancing technical knowledge among farmers, ultimately contributing to food security, rural livelihoods, and farmers' welfare.

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