Evaluation of improved pigeon pea (*Cajanus cajan*) varieties for organoleptic dal quality in India


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Pigeon pea (*Cajanus cajan* L.) is an important pulse crop in the Indian diet and one of the most important sources of dietary protein for the population. Organoleptic qualities of pigeon pea dal were tested to draw conclusions on the preferred varieties. Organoleptic qualities such as taste, texture, aroma, tenderness, sweetness and overall acceptance were tested by a trained sensory panel. Available and commercially viable improved varieties were selected for the analysis. All samples were milled and cooked under the same conditions. Results indicated that PUSA ARHAR 16, one of the improved varieties, presents a good potential in terms of agronomic characteristics for farmers and is also well accepted by the sensory panel during the organoleptic evaluation. Generating sound scientific evidence on organoleptic characteristics of pigeon pea is important for the breeders, as they will evaluate which varieties have a commercial potential and are accepted by the consumers.

Key words: Consumer preferences, organoleptic qualities, pigeon pea, India

INTRODUCTION

Pigeon pea (*Cajanus cajan*) is an important pulse crop in the Indian diet and one of the most important sources of dietary protein for the population. In the context of the fifth phase of the Indo-Swiss Collaboration in Biotechnology (ISCB), an assessment of the physical and organoleptic qualities of dal made from pigeon pea seed was carried out. In India, pigeon pea is mainly consumed as dal which is the preparation in the form of soup made from split seeds of pigeon pea. Its preparation involved cooking (boiling) of split seeds in water followed by frying in vegetable oil with various spices. Dal of pigeon pea is consumed all over the India and constitutes the main constituent of vegetarian diet. Studies of the natural genetic variability of pigeon pea and the presence of its wild relatives in the region indicate that India is the primary center of origin of pigeon pea (Joshi et al., 2001; Saxena, 2008; Saxena et al., 2010; Parray et al., 2019). Several physical, biochemical and organoleptic factors affect dal quality (Singh Raghuvanshi et al., 2011; Chandegara and Joshi, 2002). Thus, an assessment of
Table 1. Varieties evaluated for organoleptic traits.

<table>
<thead>
<tr>
<th>Varieties</th>
<th>Pedigree</th>
<th>Agronomic characteristics</th>
<th>Seed color</th>
<th>Seed weight (g/100 seeds)</th>
<th>Place of origin</th>
<th>Year of release</th>
</tr>
</thead>
<tbody>
<tr>
<td>PUSA 992 (Control)</td>
<td>Selection of 90306</td>
<td>Indeterminate growth, semi-spreading, early maturing (135-140 days), yields about 1200-1500 kg/ha, suitable for pigeon pea and wheat cropping system</td>
<td>Yellow brown</td>
<td>8.2</td>
<td>IARI, New Delhi</td>
<td>2002 (CVRC)</td>
</tr>
<tr>
<td>AL 882</td>
<td>PUSA 982 X ICPL 85024</td>
<td>Determinate growth habit, early maturing (132 days)</td>
<td>Yellow brown</td>
<td>7.6</td>
<td>IARI, New Delhi</td>
<td>2018</td>
</tr>
<tr>
<td>PAU 881</td>
<td>H-89-5 X ICPL 85024</td>
<td>Indeterminate growth, early maturing, semi-spreading, suitable for pigeon pea and wheat cropping system</td>
<td>Yellow brown</td>
<td>7.5</td>
<td>PAU, Ludhiana</td>
<td>2007 (SVRC)</td>
</tr>
<tr>
<td>PUSA ARHAR 16</td>
<td>Selection of single plant progeny of superior recombinants selected from the population improvement approach involving diverse genotypes viz., ICP 85059, ICPL 390, ICPL 267, Manak, H-92-39 and ICP 85024</td>
<td>Determinate, erect and compact, extra early, matures in about 120 days, yields about &gt; 1000 kg/ha</td>
<td>Brown</td>
<td>7.4</td>
<td>IARI, New Delhi</td>
<td>2018 (SVRC)</td>
</tr>
<tr>
<td>BSMR 853</td>
<td>(ICPL 736 X BDN 1) X BDN 2</td>
<td>Indeterminate growth, spreading, resistant to wilt and sterility mosaic disease</td>
<td>White</td>
<td>11-12</td>
<td>ARS, Badnapur</td>
<td>2001 (SVRC)</td>
</tr>
<tr>
<td>BSMR 736</td>
<td>CTP 7217 X No. 148</td>
<td>Red seeds, resistant to wilt and SMD</td>
<td>Red</td>
<td>10-11</td>
<td>ARS, Badnapur</td>
<td>1994 (SVRC)</td>
</tr>
<tr>
<td>BDN 711</td>
<td>Sel. From BPG 111</td>
<td>Indeterminate growth, spreading, resistant to wilt and sterility mosaic disease, escape terminal drought</td>
<td>White</td>
<td>10-12</td>
<td>ARS, Badnapur</td>
<td>2012 (SVRC)</td>
</tr>
</tbody>
</table>

these factors and acceptance to consumers is an important aspect of quality in pigeon pea. The overall goal of the ISCB program was to contribute towards food security and sustainable agriculture in India through innovative biotechnology approaches. One component of the program was to breed pigeon pea varieties to overcome production constraints such as low yields, resistance to pod borer (*Helicoverpa armigera*) and maruca pod borer (*Maruca vitrata*), and early maturity. The study also aimed at identifying market preferred seed types and traits; and understanding of seed supply systems along with utilization of quality seed of improved varieties. Additionally, the study determined which types of pigeon pea varieties farmers grow, the farmers’, processors’ and consumers’ preferences in choice of the grain type, and constraints to production. With these results, research strategies for improvement of pigeon pea production could be formulated (Fromm and Egger, 2018; Fromm and Singh, 2019). An organoleptic evaluation of selected improved pigeon pea varieties was conducted using methods and recommendations found in the literature on best practices for sensory evaluations (Beckley and Kroll, 1996; Lawless and Heymann, 1998; Moskowitz et al., 2003; Lyon, 2001). The aim of this organoleptic evaluation was to identify which newly released variety had acceptable sensory characteristics and is preferred by the panelists.

MATERIALS AND METHODS

Plant material and sample collection

The seeds of the varieties were procured from the Breeding Institutes which developed that variety (Table 1). In the present investigation, the leading pigeon pea varieties of India were utilized to assess the organoleptic evaluation. The major pigeon pea growing area in India is Central zone which comprises about 82% area of India. The leading varieties of these zones are BSMR 853, BDN...
RESULTS AND DISCUSSION

The results of the sensory evaluation indicated that pigeon pea variety PUSA ARHAR 16 was favored in terms of taste, texture, appearance, aroma and overall acceptance (Figure 1). Pigeon pea variety PUSA 992 was used as the control variable and was favored by the panel in terms of the organoleptic characteristic tested. Pigeon pea varieties BSMR 853 and BDN 711 were the
least favored varieties.

Pigeon pea variety PUSA 992 was used as a control because of its wide availability in the market and wide consumption across India. Both the control and improved variety PUSA ARHAR 16 was rated highest scores, 8 and 9, for overall acceptance (Figure 2). Sweetness and tenderness where rated using a different scale. Sweetness of pigeon pea dal in India is understood as a positive characteristic and although dal is consumed as a savory dish, notes of sweetness are favored by the local consumers. PUSA ARHAR 16 and BSMR 736 were evaluated as having this sweetness quality. The results indicated that most varieties are moderately soft, PUSA ARHAR 16 having the most tender quality. Tenderness is also considered a desirable trait by the local consumers and is also perceived as an indication of faster cooking.

Figure 2. Ratings of organoleptic evaluations per characteristic.
Conclusion

The organoleptic evaluation of the selected improved pigeon pea varieties gives an indication of which of the varieties can be released to the market with a higher possibility of commercial success. It is of paramount importance to breeders that the genetic material and varieties they have worked on for many years are not only accepted by the farmers because of their improved characteristics (that is early maturity, drought and pest resistance, higher yields) but also accepted by the consumers because of their good organoleptic characteristics. Based on the results of the organoleptic evaluation, PUSA ARHAR 16 presents the most favorable scores, which are likely to be accepted by consumers. The agronomic traits of this improved variety are also favorable for the farmers and present a good potential for wider cultivation in India.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

REFERENCES


