Morphological Characterization of Underutilized Legume Sword Bean (*Canavalia gladiata* Jacq.)Genotypes of North-Eastern Hill Region of India Under Foot Hill of Arunachal Pradesh

ABSTRACT

Leguminous crops are important components of Indian horticulture, because of being an important source of nutrition in predominantly vegetarian diet. In order to investigate the genetic diversity present in the underutilized legume sword bean genotypes of North-Eastern hill region of India 20 native sword bean (*Canavalia gladiata* Jacq.) genotypes were collected from different agroclimatic region of North-Eastern hill region of India. The morphological characters were observed in days to seed germination i.e. (3-6 days), pod length (16.45-32.87 cm), pod width (2.28-4.33 cm), pod weight (17.92-31.93 g), pod girth (7.75-12.64 mm) and seed weight (0.75-2.35 g). Performance of CHF SB-1, CHF SB-18, CHF SB-11, CHF SB-19, CHF SB-15, CHF SB-4 and CHF SB-10 genotypes under test conditions was superior and suggested that breeders might exploit the genome of these genotypes in current pulse crop improvement programmes.

Keywords: Horticulture; Genetic Diversity; Sword Bean; Underutilized; Vegetarian; North-Eastern hill region of India.

ABBREVIATIONS

ICAR: Indian Councilof Agricultural Research
CAU: Central Agricultural University
N: North
E: East
Viz.: Namely
cm: Centimeter
mm: Millimeter
g: Gram
I.e.: Thatis

1. INTRODUCTION

India is often referred to as a predominantly vegetarian nation due to a combination of cultural, historical, religious and economic factors [1]. While it's essential to note that not every individual in India is vegetarian, a significant portion of the population does follow a vegetarian diet. legumes are highly preferred in India for vegetarian diets due to their nutritional value, affordability, cultural significance, versatility, satiety, environmental considerations, and alignment with religious and cultural practices. These factors collectively make legumes an integral part of the Indian vegetarian diet and contribute to their widespread popularity.

20 genotypes of sword bean were collected from various parts of North-Eastern hill region of India. Sword bean, scientifically known as *Canavalia gladiata* Jacq., is a tropical and sub-tropical legume plant that is primarily grown for its edible beans and attractive flowers. The most notable feature of the sword bean plant is its long, flat and somewhat sword-shaped pods [2]. These pods measure about 20 to 40 cm (7.87 to 15.75 inches) in length and are typically green, turning yellow or brown as they mature. Each pod contains several large, flat and oval-shaped or kidney shaped seeds or beans [3]. The sword beans, which are the seeds found inside the pods are edible. These consume when young and

tender, similar to other green beans. The pods become tough and less palatable when mature. Therefore, it is essential to harvest the pods when young and tender for the best flavour and texture. The beans have mild and nutty flavour thus making them suitable for various culinary preparations. Sword beans can be prepared and cooked in a similar manner to other beans. They can be steamed, stir-fried, boiled or included in a variety of dishes like salads, stews and curries. The young, tender beans are preferred for consumption. Sword beans are a good source of plant-based protein [4], making them an excellent choice for vegetarians and vegans. The pod is high in dietary fiber, which aids in digestion and helps maintain bowel regularity and also good source of vitamin C, vitamin A and minerals like potassium and iron. The beans also contain antioxidants that help to protect cells from damage caused by free radicals. Sword beans are a versatile and nutritious addition to the diet and their cultivation can serve both culinary and ornamental purposes [5].

Sword bean is perennial in nature but are often cultivated as annual crop. The plant requires warm and sunny weather and grows well under organic rich well-drained soil [6]. The plant is adapted to adverse environmental conditions and can thrive under extreme stress conditions [7].

The genotypes of underutilized vegetables unless collected from different regions are properly evaluated and their attributes become known to breeders, will have little practical use. Sword beans are mostly consumed by rural peoples of North-Eastern hill region. The diversity in sword bean observed based on morphological characters in the present study could be of interest to the breeders in breeding programme. Therefore, the present investigation was undertaken with the objective of exploring the lesser-known neglected sword bean grown in North-Eastern hill region and analysis was done based on 6 morphological characters. The differences in morphological characters among the 20 sword bean genotypes have been enlisted in table 1.

2. METHODOLOGY

A total of 20 sword bean genotypes were collected from various parts of North-Eastern hill states of India were used assess the genetic diversity among the sword bean genotypes. A trial was carried out in open field conditions at vegetable research farm, (latitude: 28.0632◦ N; longitude: 95.3239◦ E;) College of Horticulture and Forestry, Central Agricultural University (Imphal), Pasighat, Arunachal Pradesh during 2022. The region has sub-tropical climate. The seeds were soaked overnight in distilled water to ensure maximum germination and one seed per hole was directly sown under open field condition. Fresh pods were harvested from each genotype for recording morphological data. Morphological characters of sword bean were recorded using Indian bean descriptors [8], due to unavailability of descriptor for sword bean. A total of six morphological characters *viz.,* days to seed germination, seed weight, pod length, pod width, pod weight and pod girth were measured. The experimental scheme with three replications was design in randomized block design. The observations were recorded for five plants per genotypes per plot for each replication. The data were statistically analyzed for computation of mean performance.

3. RESULTS AND DISCUSSION

A considerable variation among the 20 genotypes of sword bean in six morphological characters was found. The evaluation of morphological characters showing significant differences among the 20 genotypes for all the characters investigated are given in table1. Observations recorded for morphological characters revealed wide range of variation, especially in days to seed germination (3-6 days), pod length (16.45-32.87 cm), pod width (2.28-4.33 cm), pod weight (17.92-31.93 g), pod girth (7.75-12.64 mm) and seed weight (0.75-2.35 g)which confirms results of study[9]. The CHF SB-18 genotype was reported to have highest pod length (32.87 cm) among the various genotypes investigate followed by CHF SB-19 (31.27 cm) and CHF SB-11 (31.10 cm). All the genotypes showed low incidence of pests and diseases. Keeping in view of the variation present among different genotypes on the basis of morphological character, priority should be given to genotypes having high pod weight, pod length and pod width for getting higher pod yield thus these parameters could be considered while formulating the selection indices for improvement of sword bean.

Table 1. Morphological characters of different sword bean genotypes

Genotypes	Days to seed germination (days)	Pod length (cm)	Pod width (cm)	Pod weight (g)	Pod girth (mm)	Seed weight (g)
CHF SB-1	3	17.60	2.28	22.15	8.17	0.75
CHF SB-2	4	20.47	2.34	30.78	10.98	1.39
CHF SB-3	5	25.19	2.57	23.01	9.24	1.52
CHF SB-4	5	24.21	2.56	31.93	11.93	1.37
CHF SB-5	4	26.20	2.75	24.50	9.37	1.43
CHF SB-6	4	30.05	2.73	24.51	9.28	1.72

CHF SB-7	5	18.23	2.35	23.26	10.12	2.16
CHF SB-8	5	26.72	2.72	25.10	9.27	1.58
CHF SB-9	4	30.17	2.84	26.01	7.75	1.64
CHF SB-10	5	23.02	2.57	21.82	8.49	1.49
CHF SB-11	4	31.10	2.95	25.20	9.26	1.62
CHF SB-12	3	28.17	2.59	24.60	9.34	1.57
CHF SB-13	4	29.20	2.55	25.10	9.21	2.18
CHF SB-14	6	25.35	2.89	21.78	9.06	2.03
CHF SB-15	5	16.45	4.33	17.92	12.64	1.61
CHF SB-16	4	28.26	2.94	23.20	8.52	2.26
CHF SB-17	6	28.09	3.25	23.63	8.94	1.59
CHF SB-18	4	32.87	2.33	27.41	12.31	1.70
CHF SB-19	5	31.27	2.79	26.02	11.32	2.13
CHF SB-20	4	28.80	2.83	24.60	9.51	2.35

4. CONCLUSION

The wide genetic diversity found in sword bean genotypes collected from North-Eastern hill region of India based on morphological characters and less incidence of insect-pest and diseases gives an insight for the application of these genotypes in breeding programme to develop high yielding, disease and insect-pest resistant varieties and also widen the genetic base for their future breeding programmes.

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