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RDS Yadav
Department of Genetics and Plant Breeding, N.D. University of Agriculture and Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

Purushottam
Department of Genetics and Plant Breeding, N.D. University of Agriculture and Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

Mohit Gupta
Department of Genetics and Plant Breeding, N.D. University of Agriculture and Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

Jitender Bhati
Department of Genetics and Plant Breeding, N.D. University of Agriculture and Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

Pradeep Yadav
ICAR-Indian Institute of Pulses Research, Kanpur, Uttar Pradesh, India

Correspondence
RDS Yadav
Department of Genetics and Plant Breeding, N.D. University of Agriculture and Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

Diagnostic characteristics of fieldpea varieties

RDS Yadav, Purushottam, Mohit Gupta, Jitender Bhati and Pradeep Yadav

Abstract
Fifteen promising varieties (DDR 23, DDR 27, DDR 44, HPP 4, HUDP 15, HUP 2, IM 9101, IM 9102, JM 6, JP 885, KPP 103, KPMR 400, KPMR 522, Rachna and Sapna) of fieldpea were studied for theis various attributes relating to the distinctness, uniformity and stability test National guidelines. The varieties of fieldpea following its National guidelines. The varieties were distinguished by more precisely definable and discernable morphological characteristics namely, stem anthocyanin coloration, foliage colour, leaf/ leaflets type, rabbit eared stipule, stipule type, leaf juncture colour, flowering time, plant type, flower colour, number of pods/axil, pod shape, pod beak, seed shape, cotyledon colour, seed size and test mottling. These characters expressed uniformity and stability over years. Therefore, present character profile can be used as reference for seed industries, certification agencies, seed testing labs, researchers, etc, and also in preparation of final draft/ data base of this crop varieties in context to the Protection of Plant Varieties and Farmer's Rights and globalization of WTO regimes.

Keywords: Diagnostic characteristics, fieldpea

Introduction
Globally, field pea (Pisum sativum L., 2n=14) is the third most important pulse crop after dry bean and chickpea, and third most popular rabi pulse of India after chickpea and lentil. India rank fourth position in area by growing it over 10.6 lakh ha and 5th position in production after producing about 10.10 lakh tonnes during 2017-18 (Anon., 2018). Uttar Pradesh is the major field pea growing state. It alone contributes about 49 % of total production in India. Besides, Madhya Pradesh, Bihar and Maharashtra are the major pea producing states. Field pea is used primarly as whole or split into dal and also in various ways for human consumption or livestock feed as green fodder and staw and also as cover crop to prevent soil erosion. Field pea has high levels of the amino acids, lysine and tryptophan, which is relatively low in cereal grains. It contains appriximately 21 to 25% protein, 1.8% fat, 62.1% carbohydrate, 64 mg/100g calcium and 4.8 mg/100g iron, and 86 to 87 per cent total digestible nutrients which makes them an excellent livestock feed. It has also shown that field pea is an excellent protein supplement in swine, beef cow and feed to dairy and poultry rations (Endres *et al*., 2016) [3]. Field pea is a legume crop and has the inherent ability to obtain much of its nitrogen requirement from the atmosphere by forming a symbiotic relationship with Rhizobium bacteria in the soil. It is among the most highly efficient nitrogen-fixing crops and may obtain as much as 80 per cent of its tital nitrogen requirement from fixation under good growing condtions (Endres *et al*., 2016) [3]. There had been a wide range of variability for marpho-agronomic traits including protein patterns and molecular markers (Mishra *et al*.,1998; Renu and Mishra, 2003) [5, 6] as well as its phylogenetical analysis based on morphological characters, allozyme and RAPD markers (Honey *et al*., 1996) [4]. However, the knowledge about their attributes relating to the Distinctness, Uniformity and Stability (DUS) test which generates official description of a variety to be used for assessing Varietal purity (in crop inspection & grow out test), to identify one to more precisely definable and discernable phenotypic character(s) having least environmental influence for certification purpose and to match this character profile with that submitted by the applicant for the purpose of deciding to grant or not grant the registration of a new variety, is meagre. Keeping these and globalization of WTO regimes and the scenario of Intellectual Property Rights (IPR) in views, the present investigation was undertaken to assess the distinctness, uniformity and stability of promising varieties in the fieldpea.

Materials and Methods

Healthy and uniform seeds of fifteen promising varieties (Table 1) of fieldpea obtained from Indian Institute of Pulses Research, Kanpur were studied for their various attributes pertaining to the distinctness, uniformity and stability test at Crop Research Station, Masodha. Each test material was sown in 6 rows at 5 meter length adopting a row spacing of 60 cm for dwarf and 90 cm for tall varieties and 10 cm between the plants in a randomized block design with 3 replications. Recommended packages of practices were followed to raise an ideal crop. The diagnostic characteristics of varieties studied as per its national test guidelines (Anon., 2001) and the mean of both years for the characters, where required, were obtained and deigned the character profiled accordingly.

Table 1: Diagnostic characteristics of some promising varieties of fieldpea.

Characteristic	DDR23	DDR27	DDR44	HPP4	HUDP15	HUP2	IM9101	IM9102	JM6	JP885	KPP103	KPMR400	KPMR522	Rachna	Sapna
Stem anthocyanin colouration	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
Foliage colour	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Light green	Green	Green	Green	Green
Leaf /leaflets	Present	Present	Absent	Absent	Absent	Absent	Present	Present	Present	Present	Present	Absent	Absent	Present	Absent
Rabbit eared stipule	Absent	Absent	Absent	Absent	Absent	Present	Present	Absent	Present	Absent	Present	Absent	Absent	Present	Absent
Stipule type	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal
Leaf juncture colour	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Flowering time	Very early	Very early	Medium	Late	Late	Late	Medium	Medium	Medium	Late	Late	Medium	Late	Late	Late
Plant height	Dwarf	Dwarf	Dwarf	Dwarf	Slightly taller	Dwarf	Tall	Tall	Tall	Tall	Tall	Dwarf	Dwarf	Tall	Dwarf
Flower colour	White	White	White	White	White	White	White	White	White	White	White	White	White	White	White
No. of podsaxil	Double	Double	Double	Double	Double	Double	Double	Mostly double	Double	Double	Double	Double	Double	Double	Double
Pod shape	Curved	Straight	Straight curved	Straight curved	Straight	Straight	Straight	Straight	Straight	Straight curved	Straight	Straight	Straight	Straight	Straight
Pod beak	Pointed	Pointed	Pointed	Pointed	Pointed	Pointed	Pointed	Pointed	Pointed	Pointed	Pointed	Pointed	Blunt	Pointed	Pointed
Pod colour	Light green	Light green	Green	Green	Light green	Light green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Seed shape	Spherical	Spherical	Spherical	Spherical	Spherical	Spherical	Spherical	Spherical	Spherical	Spherical	Spherical	Spherical	Spherical	Spherical	Spherical
Cotyledon colour	Yellow	Green	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Seed size	Medium	Bold	Bold	Medium	Bold	Bold	Bold	Medium	Bold	Bold	Bold	Bold	Medium	Bold	Bold
Test mottling	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent

Results and Discussion

The character profile with respect to each variety under studied is presented in table 1. It could be seen from the table that these varieties could clearly be distinguished either by one or more characters such as foliage colour, leaf/ leaflets, rabbit ear stipule, flowering type, plants type, pod beak, pod colour and seed size. Some other characters namely, stem anthocyanin coloration, stipule type, leaf juncture colour, flower colour, number of pods/ axil and testa mottling were not easly discriminate among the varieties under studied. These were mainly due to their narrow genetic base. Similar type of findings have also being reported during characterization of germplasm on the basis of molecular markers (Renu and Mishra, 2003) [6]. Further, these characters showed uniformity in their expression and stable over the years. These findings could easily be utilized by seed industries, certification agencies, seed testing lab., researchers, etc. furthermore, these are being contributed in preparation of final draft/data base of this crop varieties in our country which could ever be utilized as and when required in the context to an cat on protection of plant varieties and farmer`s Rights (PPV&FR).

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