ISSN: 2230-9926

Available online at http://www.journalijdr.com

IJDR

International Journal of Development Research
Vol. 4, Issue, 5, pp. 1125-1128, May, 2014

International Journal of
DEVELOPMENT RESEARCH

Full Length Research Article

THE CHARACTERIZATION OF CASTOR (*RICINUS COMMUNIS* L.) GERMPLASM FOR MORPHOLOGICAL TRAITS

***Srinivasa Rao, M., Udaya Bhanu, K., Satyanarayana Rao, V. and Lal Ahamed, M.**

Department of Genetics and Plant Breeding, Agricultural College, Acharya N.G. Ranga Agricultural University, Bapatla-522 101, Andhra Pradesh, India

ARTICLE INFO

Article History:
Received 20th February, 2014
Received in revised form
09th March, 2014
Accepted 28th April, 2014
Published online 31st May, 2014

Key words:
Castor,
Morphological characterisation,
DUS guidelines

ABSTRACT

Fifty four genotypes were characterized based on their morphological characters as per DUS guidelines of castor *viz*., stem colour, types of inter nodes on stem, plant branching pattern, petiole colour, lamina leaf colour, bloom, type of inflorescence, colour of stigma, capsule type, spike shape, spike compactness, seed colour. The germplasm has shown great extent of morphological variability for all the traits observed.

INTRODUCTION

Castorbean (*Ricinus communis* L.) is an industrial oil seed crop containing about 45 - 58 percent oil, which has tremendous application in petrochemicals, pharmaceuticals, cosmetics, textiles, chemicals, soap, leather, paints, varnishes, ink, nylon and plastic. Castor oil is traditionally associated with medicinal and veterinary use in the fields of obstetrics, dermatology *etc*. It is also used as laxative. Presently, its utilization as bio-diesel has magnified its importance. Its oil does not freeze even at high altitudes and it is one the best lubricants for jet engines. Morphological characterization of seed, seedling and plant would generally be considered for varietal identification. Introduction of Plant Variety Protection under General Agreement on Trade and Tariff (GATT) necessitated the need for precise genotypic characterization with clear Distinctiveness (D), Uniformity (U), Stability (S). The concept of DUS was fundamental to the characterization of the variety as a unique creation. It is essential to secure Plant Breeders Right's (PBR's) and it also generates official description of a variety. Information on DUS characters of the parental lines generated in castor is not documented until now. Hence, there is a need to characterize castor genotypes.

***Corresponding author: Srinivasa Rao, M.,** Department of Genetics and Plant Breeding, Agricultural College, Acharya N.G. Ranga Agricultural University, Bapatla-522 101, Andhra Pradesh, India*

MATERIALS AND METHODS

The main objective of the investigation was to characterize the castor germplasm to assess their potential to contribute to future crop improvement programmes. The fifty four castor germplasm lines were evaluated at Agricultural College Farm, Bapatla, Andhra Pradesh, in Randomized Block Design in two replications with inter and intra row spacing of 90 x 60 cm. Need based agronomic and plant protection measures were taken up for good crop growth. Data was collected at various growth stages of castor plant. Bloom nature was recorded on emerging fresh leaves before flowering, type of braching, type of inflorescence and colour of stigma were recorded during flowering, capsule type, spike shape, spike compactness recorded at dough grain stage, seed colour during harvesting. Stem colour, petiole color and lamina colour were recorded before flowering.

RESULTS AND DISCUSSION

Varietal testing and release system in all the crops basically concentrates on generating data on parameters like yield, quality, reaction to pests and diseases, agronomic adaptability *etc*. (Tandon, 1992). Introduction of plant variety protection under GATT, necessitated the need for testing of varieties for their Distinctness (D), Uniformity (U) and Stability (S). The

Table 1. Morphological characterization of Castor genotypes

S.no	Entry	Stem colour	Type of internodes	Branching pattern	Petiole colour	Lamina leaf colour	Bloom colour	Type of inflorescence	Colour of stigma	Capsule type	Spike shape	Spike compactness	Seed colour
1	PPL 101	DR	E	C	R	G	DB	IS	R	S	CO	L	B
2	PPL 102	R	E	C	R	G	DB	IS	P	S	CO	C	B
3	PPL 103	R	E	C	GR	G	DB	IS	R	S	CO	SC	B
4	PPL 104	R	E	C	R	G	DB	IS	R	S	CO	SC	B
5	PPL 105	DR	C	C	R	DG	DB	IS	R	S	CO	SC	B
6	PPL 106	DR	E	C	R	DG	DB	IS	DR	S	CO	SC	B
7	PPL 107	R	E	C	R	DG	DB	IS	P	S	CO	L	M
8	PPL 108	DR	E	D	DR	DG	DB	IS	R	S	CO	SC	B
9	PPL 109	R	E	D	GR	G	DB	IS	R	S	CO	C	B
10	PPL 110	DR	E	C	DR	GR	DB	IS	DR	S	CO	C	DC
11	PPL 111	R	C	C	R	G	DB	IS	P	S	CY	SC	DC
12	PPL 112	R	C	C	GR	G	DB	IS	R	NS	CY	SC	B
13	PPL 113	R	E	C	GR	G	DB	IS	P	NS	CY	SC	M
14	PPL 114	R	E	C	GR	G	DB	IS	R	S	CO	C	DC
15	PPL 115	DR	E	D	R	DG	DB	IS	R	S	CO	C	B
16	PPL 116	R	E	C	R	GR	DB	IS	R	S	CO	C	B
17	PPL 117	R	E	C	GR	G	SB.	MON	DR	S	CO	C	M
18	PPL 118	R	E	C	GR	G	DB	IS	P	S	CO	C	B
19	PPL 119	R	C	C	R	G	DB	IS	DR	S	CO	SC	M
20	PPL 120	R	E	D	GR	G	DB	IS	R	NS	CO	SC	B
21	PPL 121	R	E	D	R	GR	DB	IS	P	S	CO	C	DC
22	PPL 122	DR	E	D	R	DG	DB	IS	DR	S	CO	SC	B
23	PPL 123	R	E	D	GR	GR	DB	IS	R	S	CO	L	B
24	PPL 125	R	E	C	R	GR	DB	MON	DR	S	CO	SC	M
25	PPL 126	R	E	C	R	G	SB	IS	DR	S	UMB	SC	M
26	PPL 128	R	E	D	R	G	DB	IS	R	S	CO	SC	B
27	PPL 129	DR	E	C	DR	DG	DB	IS	R	S	CO	L	B
28	PPL 130	R	E	D	R	G	DB	IS	R	S	CY	L	DC
29	PPL 131	R	E	C	GR	G	DB	IS	P	S	CO	SC	DC
30	PPL 132	DR	E	C	GR	DG	DB	IS	DR	S	CY	L	DC
31	PPL 133	DR	C	C	R	GR	DB	IS	R	S	CO	SC	DC
32	PPL 134	DR	C	D	DR	GR	DB	IS	R	S	CO	SC	DC
33	PPL 135	DR	E	D	DR	G	DB	IS	DR	S	CO	SC	M
34	PPL 136	R	E	D	GR	DG	DB	IS	R	S	CO	L	B
35	PPL 137	R	E	D	GR	G	DB	IS	P	S	CO	SC	DC
36	PPL 138	DR	E	C	R	GR	DB	IS	DR	S	CO	L	B
37	PPL 139	R	E	C	R	G	DB	IS	P	S	CO	L	B
38	PPL 140	R	E	C	R	DG	DB	IS	P	S	CO	L	B
39	PPL 141	DR	E	C	DR	G	TB	IS	R	S	CY	L	DC
40	PPL 142	R	E	C	R	DG	DB	IS	R	S	CY	SC	B
41	PPL 143	R	E	C	GR	DG	DB	IS	DR	S	CO	L	B
42	PPL 144	DR	E	C	R	G	DB	IS	DR	S	CO	SC	DC
43	PPL 145	R	E	D	R	G	DB	IS	P	S	CO	SC	DC
44	PPL 147	R	E	C	GR	DG	TB	IS	R	S	CO	L	B
45	PPL 148	DR	E	C	DR	GR	DB	IS	R	S	CO	L	M

…….Continue

46	PPL 149	DR	C	C	R	GR	DB	IS	R	S	CO	SC	B
47	PPL 150	DR	E	D	R	G	DB	IS	R	S	CO	L	B
48	PPL 151	DR	E	C	R	GR	DB	IS	R	S	CO	L	B
49	DPC-9	G	C	C	G	G	DB	IS	R	S	CO	C	M
50	GCH-4	DR	E	D	R	G	DB	IS	R	S	CY	L	DC
51	M-574	G	C	C	G	G	DB	IS	DR	S	CO	SC	B
52	PCH 80	G	E	C	G	G	DB	IS	R	S	CO	L	DC
53	PCH 111	G	C	C	G	G	DB	IS	R	S	CY	L	B
54	KIRAN	DR	C	C	R	GR	DB	IS	DR	NS	CO	L	M

1. Stem colour – green(G), red(R), dark red(DR).
2. Type of internode – condensed(C), elongated (E).
3. Plant branching pattern – convergent(C), divergent(D).
4. Petiole colour – green(G), green with reddish tinge(GR), red(R), dark red(DR).
5. Lamina leaf colour –green(G), dark green(DG), green with reddish tinge(GR).
6. Bloom – no bloom(NB), single bloom(SB), double bloom(DB), triple bloom(TB).
7. 7. Type of inflorescence – monoecious(MON), interspersed staminate flowers(IS), pistillate(P).
8. 8. Colour of stigma – pink(P), red(R), dark red(DR).
9. 9. Capsule type – non spiny(NS), spiny(S).
10. 10. Spike shape – umbrella(UMB), cylindrical(CY), conical(CO).

DUS test included a detailed botanical examination using a standard list of descriptors. This is intended to remove any confusion in naming new varieties proposed for registration under plant variety protection (PPV) authority (Mauria, 2005). The guide lines for DUS testing in many crops are developed by UPOV and were used to modify under Indian conditions. Castor, being the native crop of India, guidelines for DUS testing is being developed at Directorate of Oilseeds Research. The present study is an attempt in this direction and helped in standardizing the guidelines of DUS testing in castor. Among 54 genotypes studied, much variation was found for most of the orphological characters. Stem colour was dark red in 21 genotypes, red in 29 genotypes, and green in 4 genotypes. Type of internodes on stem were condensed in 11 genotypes remaining were elongated. Plant branching pattern was divergent in 16 genotypes remaining 38 genotypes were convergent. Petiole colour was green with reddish tinge in 15 genotypes, dark red in 7 genotypes, 4 genotypes showed green petiole remaining 28 genotypes showed red petiole. Lamina leaf colour was green with reddish tinge in 12, dark green in 13 and green in 29 genotypes.

Bloom or waxy coating in castor is an important morphological marker and serves as a natural protection against drought, cold, jassids *etc*., (Lavanya and Gopinath 2008). Based on presence of bloom on combination of plant parts, genotypes in castor were usually classified as single bloom (stem + petiole + capsule stalks), double bloom (stem + petiole + capsule + lower side of the leaf) and triple bloom (all the above parts + upper side of the leaf).

Double bloom in 50 genotypes, triple bloom in 2 genotypes and two genotypes has single bloom. Two genotypes with monoecious type of inflorescence, remaining were interspersed staminate flower type. Colour of stigma was dark red in 14 genotypes, pink in 11 genotypes and red in 29 genotypes. Capsule type was non spiny in 4 genotypes and spiny in 50 genotypes. Spike shape was conical in 44 genotypes, cylindrical in 9 genotypes and umbrella shape in one genotype. In castor, spikes are classified based on the arrangement or density of capsules on the spike as loose, compact, semicompact. Compact and semi compact spikes are highly susceptible to fungal diseases like Botrytis under conditions of high humidity, rainfall, cloudy weather due to poor aeration and ventilation.

Compact spike in 10 genotypes, 20 genotypes had loose spike and semi compact in 24 genotypes. Maroon seed colour in 10 genotypes, 15 genotypes had deep chocolate colour and 29 genotypes had brown colour (Table 1). The assessment of distinctness can be done by grouping these genotypes into groups. Characteristics suitable for grouping purposes are those which are known from experience and not vary within a variety (Chakrabarty *et al.* 2006). A genotype/variety is considered to be distinct if observations / measurements show it to differ consistently from all others. Hence, the study is of significance in testing distinctiveness of genotypes. The present findings are in agreement with earlier investigations of Muhammad *et al.* (1971), Jagdish *et al.* (1994), Varier *et al.* (1999), and Rajendraprasad *et al* (2003) which showed that morphological characterization helps in identification of genotypes easily.

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