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HIGH YIELDING VARIETY OF TORIA (*BRASSICA COMPESTRIS* SYN. RAPA L.): RAJ VIJAY TORIA-1

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ABSTRACT

Toria variety **RVT-1** (RMT-08-7) has been developed from JT-1xT-9 and evaluated for seed yield, oil yield and reaction to insect pest and diseases under AICRP-R&M trials and on farmers' field. Morphologically plants were erect, spreading in nature and matured in 98-105 days and had more number of primary and secondary branches and more number of seeds/siliqua than checks. It showed its superiority over checks in IVT and AVT trials by 19.20%, 23.63%; whereas, seed yield (1240 Kg/h and 1240 Kg/h) was obtained on farmers field indicated that recorded an increase of 28.50% % and 34.59 % over farmer's own seed during two successive years respectively. In IVT and AVT, RVT-1 showed 21.33% and 23.49% increase oil yield (kg/h) over checks PT-303 and Bhawani. DNA finger printing profile indicated that primers PUT-3, PUT-181, PUT-171, PUT-154 and PUT-173 were found useful in generating unique profile for Raj Vijay Toria-1 variety. On this basis of developed 30 bands, this variety could be identified from other variety.

Figures : 02 References : 09 Tables : 09
KEY WORDS : AVT: Advance Varietal Trial, DNA finger printing, IVT: Initial Varietal Trial, RVT-1: Raj Vijay Toria-1.

Introduction

Toria (*Brassica compestris Syn. rapa* L.) is a major crop of rabi season of Chambal as well as areas of other states namely; Assam, Bihar, Orissa, and West Bengal. By virtue of its short duration and inherent high temperature tolerance during germination and seedling stages it is grown as catch crop in parts of Haryana, Himachal Pradesh, Madhya Pradesh, Chhattishgarh, Punjab, Uttarakhand and Uttar Pradesh. During the past decade, the acreage of toria has increased due to mainly introduction and large scale cultivation of long duration high yielding varieties of other crops. Even though, some early maturing varieties in 85-90 days are also available. Due to its low water requirement (80-240 mm), toria crops fit well in the rain-fed cropping system. Even though, the

TABLE-1: Performance of proposed variety RVT 1 (RMT 08-7) for seed yield (kg/h) in IVT coordinated trials during 2009-10 in zone III

Variety/ check	Seed yield (kg/h)			Mean (kg/h)	% superiority Over check
	FZB	MOR	PNT		
RMT 08-7	1301	1185	1136	1207*	
PT-303(NC)	1086	938	1161	1062	13.65
Bhawani (ZC)	901	691	938	843	25.97

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TABLE-2 : Performance of proposed variety RVT 1 (RMT 08-7) for days to maturity in IVT coordinated trials during 2009-10 in zone III

Variety/ check	Days to maturity			Mean (kg/h)
	FZB	MOR	PNT	
RMT 08-7	94	103	97	98
PT-303(NC)	90	99	97	95
Bhawani (ZC)	85	98	101	95

Mean values of Faizabad, Morena, Pantnagar Zone III (APR 2010) pPB25
*Strain(s) out yielding the best check by margin of >10%. Values in parenthesis indicate no. of locations. NC – National check, ZC- Zonal check

average productivity of toria is quite low. Therefore, there is a big challenge before the plant breeders to sustain the present yield levels of this crop.

TABLE-3 : Performance of proposed variety RVT 1 (RMT 08-7) for oil content (%)

Variety/ check	Oil content (%)			Mean (kg/h)
	FZB	MOR	PNT	
RMT 08-7	39.4	39.0	44.3	41.0
PT-303(NC)	39.9	40.0	43.8	41.2
Bhawani (ZC)	40.0	41.0	44.0	41.7

Mean values of Faizabad, Morena, Pantnagar Zone III (APR 2010) pPB25
NC – National check, ZC- Zonal check

In fact, the success in crop improvement depends on the nature and amount of variability available in the genetic resources. Hence, in this paper attempt has been made to develop best suitable variety for bajra-wheat-vegetables cropping pattern. This would increase cropping

Fig. 1 : Developed Siliquae in Toria variety RVT-1 (RMT 08-7).

TABLE-4: Mean performance of proposed variety RVT 1 (RMT 08-7) for seed yield (kg/h) in coordinated trials in two years testing (Zone III).

Variety/ check	Seed yield (kg/h)			Mean (kg/h)	% superiority Over check
	IVT+	AVT++	Total		
RMT 08-7	1207	1325	2532	1266*	
PT-303(NC)	1062	-	1062	1062	19.20
Bhawani (ZC)	843	1205	2048	1024	23.63

+Mean values of Faizabad, Morena, Pantnagar Zone III (APR 2010) pPB25

++Mean values of Faizabad, Morena, Pantnagar, Kanpur Zone III (APR 2011) pPB29

*Strain(s) out yielding the best check by margin of >10%. Values in parenthesis indicate no. of locations. **: Repeat. NC – National check, ZC- Zonal check. IVT: Initial variety trial, AVT: Advance varietal trial.

TABLE-5 : Performance of proposed variety RVT 1 (RMT 08-7) for days to maturity in coordinated trials in two years testing (Zone III).

Variety/ check	Days to maturity			Mean	% superiority Over check
	IVT+	AVT++	Total		
RMT 08-7	98	105	203	102	
PT-303(NC)	95	-	95	95	7.37
Bhawani (ZC)	95	94	189	95	7.37

TABLE-6: Performance of proposed variety RVT 1 (RMT 08-7) for 1000 seed weight (g) in coordinated trials during 2009-10 and 2010-11 in Zone III

Variety/ check	1000 seed weight (g)			Mean
	IVT+	AVT++	Total	
RMT 08-7	3.4	3.3	6.7	3.4
PT-303(NC)	3.2	3.3	6.5	3.3
Bhawani (ZC)	3.2	3.3	6.5	3.3

intensity of area which would certainly enhance the income of farmers.

Materials and Methods

This variety was developed from the cross JT-1 x T-9 at the Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, All India Coordinated Research Project on Rapeseed and Mustard [ICAR], Zonal Agricultural Research Station, Morena and tested under ACRIP net-work as directed by the Directorate of Rapeseed Mustard Research [ICAR], Bhartpur. RVT-1 (RMT 08-7) was tested in 37 locations under IVT and AVT respectively of Jammu & Kashmir, Himachal Pradesh, Uttrakhand, Punjab, Haryana, Rajasthan, New Delhi, M.P., Chhattisgarh, Bihar, West Bengal, Orissa, Assam, N.E. Hill State (Imphal and Tripura) and Gujarat states. Each year, the seed material was sown in RBD with 3 replications. The size of each plot was 5.0 M x 1.5 M and 5.00 M x 2.70 M in IVT and AVT respectively with 30 cm row to row and 10 cm plant to plant distance. The observations were recorded on randomly selected 10 plants. Mean data were collected for quantitative characters *viz;* Plant type, days to maturity, plant height (cm), number of primary branches/plant, number of secondary branches/plant, number of siliqua/ plant, number of seeds/siliqua, Siliqua length (cm), 1000 seed weight (g), oil content (%), oil yield (kg/h), seed yield/plant (g) and also took observations on the incidence of white rust, downy mildew, *Sclecrotinia* stem rot and aphid infestation. The calculations of mean, critical difference and oil content (%) analysis were performed[3,4]. Moreover, the potentiality of this variety was also tested under ACRIP-net work and on farmer's fields in order to know its performance under normal sown condition in Chambal region with recommended dose of fertilizers.

Molecular characterization of RVT-1:

g-DNA extraction and PCR conditions: g-DNA was extracted from 100mg of germinated seedlings tissues[2]. Briefly 2ìl of dissolved g-DNA was used as template in 20 ìl of reaction volume containing 1U *Taq* DNA polymerase (Fermentas), 1 X PCR buffer (Fermentas), 0.5mM primers (IDT) and 0.2 mM of dNTP mix (Fermentas). The total volume was adjusted with nuclease free water (*Invitrogen*). For PCR, the "Touchdown" thermal cycling conditions were followed: initial denaturation at 94°C for 5 min; 5 cycles of 30s at 94°C, 45s at 61°C with a 1°C decrease in annealing temperature per cycle, and 1 min at 72°C; 30 cycles of 30s at 94°C, 45s at 57°C, and 1 min at 72°C; and a final extension at 72°C for 10 min. After completion of amplification cycle samples were then stored at 4°C. Primers namely PUT-3, PUT-124, PUT-129, PUT-154, PUT-168, PUT-169, PUT-171, PUT-173, PUT-181, PUT-186, PUT-188 and PUT-256 were used to

TABLE-7: Performance of proposed variety RVT 1 (RMT 08-7) for oil yield (kg/h) in coordinated trials during 2009-10 and 2010-11 in Zone III

Variety/ check	Oil yield (kg/h)		Mean (kg/h)	% superiority Over check
	IVT+	AVT++		
RMT 08-7	494	564	531*	
PT-303(NC)	438	-	438	21.33
Bhawani (ZC)	351	509	430	23.49

TABLE - 8 : Morphological characters of RVT-1

Characters	RVT-1	PT-303	Bhawani
Days to 50% flowering	36	41	38
Days to maturity	102	95	95
Plant height (cm)	112	105	98
No. of Primary branches/plant	8	6	6
No. of Secondary branches/plant	4	3	3
No. of siliqua/plant	194	98	123
Siliqua length (cm)	4.54	3.98	3.64
No. of seeds/siliqua	19	16	16
1000 seed weight (g)	3.80	3.56	3.77
Oil (%)	44.39	43.91	44.38
Seed yield/plant (g)	9.50	8.20	6.50

generate DNA profile.

Gel-electrophoresis: The PCR products were mixed with 1x loading dye (Orange-G) and 5 ml of resultant samples were electrophoresed on 3% metaphor agarose gel at constant 80V for 3 hours. After completion of electrophoresis, the ethidium bromide stained gels were visualized under UV light in Gel documentation system.

Results and Discussion

Developed and release variety of RVT-1 gave highest seed yield (1207 kg/h) than checks namely PT-303 (NC)

TABLE-9: Allele size of the markers in Raj Vijay Toria-1 along with controls (Basant and Pusabold).

S. No.	Genic-SSR primers	Size	Basant	Pusa bold	Raj Vijay Toria 1
1.	PUT-3	469	0	0	1
2.		389	0	1	1
3.		381	1	0	0
4.	PUT-124	294	0	1	0
5.		286	1	0	1
6.	PUT-129	475	0	1	0
7.		444	1	0	1
8.	PUT-154	823	0	0	1
9.		809	0	1	0
10.		727	1	0	0
11.	PUT-168	159	1	1	1
12.		144	1	1	1
13.	PUT-169	596	0	1	0
14.		578	1	0	0
15.		561	0	0	1
15.	PUT-171	636	0	1	0
17.		614	0	0	1
18.		602	1	0	0
19.	PUT-173	909	0	1	0
20.		875	1	0	1
21.		773	0	1	0
22.		700	1	1	0
23.	PUT-181	172	1	1	0
24.		140	0	0	1
25.	PUT-186	330	1	1	1
26.	PUT-188	462	1	0	0
27.		425	1	1	0
28.		406	0	0	1
29.	PUT-256	257	0	0	1
30.		209	1	1	1

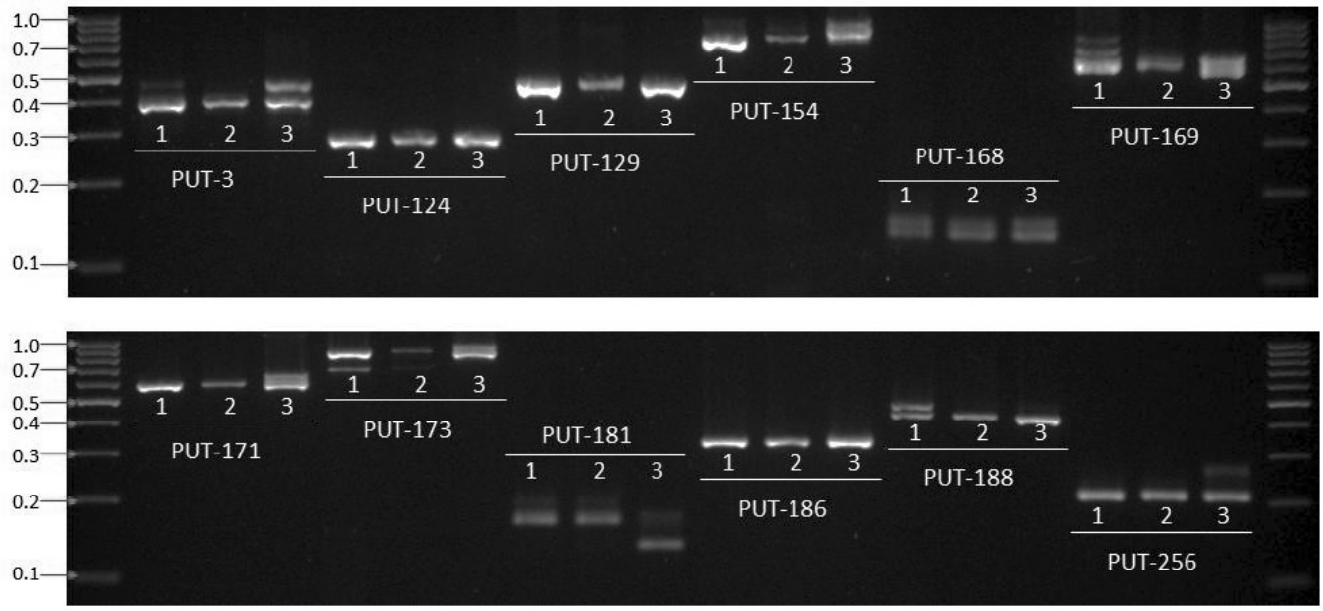

Fig. 2: DNA profile of Raj Vijay Toria-1 (lane 3) along with controls [Basant (lane 1), Pusa bold (lane 2)] generated with primer pairs of genic-SSRs (PUTs-). Molecular marker sizes are depicted in Kbp.

(1062 kg/h) and Bhawani (ZC) (843 kg/h) which is 13.65 % and 25.97% respectively at Faizabad, Morena and Pantnagar in IVT under AICRP network. Among these places, at Faizabad, it gave highest seed yield (1301 kg/h) than checks PT-303 (NC) (1086 kg/h) and Bhawani (901 kg/h) followed by the results of Morena and Pantnagar (Table 1).Whereas, RVT-1 matured 03 days late (98 days) than checks viz; PT-303 and Bhawani (95 days) in IVT trials (Zone III)[1] (Table 2). Further, there is no significant difference in oil content was observed in RVT-1 and checks (Table 3). On contrary, variation in oil content from 36% to 39% in *Brassica juncea*) was reported[9]. Reaction to disease incidence has showed no occurrence during growing period (Personal Communication by Dr. J K Babele).

In AVT trial, RVT-1 gave highest seed yield (1325 kg/h) against check Bhawani (1205 kg/h). An average IVT and AVT showed that RVT-1 gave 1266 (kg/h) which was 19.20 % and 23.63 % superior over checks viz; PT-303 (1062 kg/h) and Bhawani (1024 kg/h). In view of above more than 10% increase in seed yield was obtained in AICRP network testing. Due to this, it was promoted to AVT II trial in zone III (Faizabad, Morena, Pantnagar and Kanpur)[1] (Table 4).

Maximum seed yield (1240 kg/h) and (1210 kg/h) was obtained on farmer's field during 2013-14 and 2014-15 respectively which was 28.50% and 34.59% increase over farmer's own seed with the recommended package of practices. This was due to more no. of primary branches/plant, no. of secondary branches/plant, no. of silique /plant, siliqua length (cm), no. of seeds/siliqua and 1000 seed weight (g) contributed to enhance seed yield of toria. Similar observations were reported[6,7,8]. Selection of no. of silique/plant, no. of seeds/siliquae indicating that selection with these characters may be right approach for enhancing seed yield of new genotype[5]. In the present study, developed variety RVT-1 was delayed one week in maturity than checks (Table 5). Whereas, test-weight (g) showed that there was no significant difference between RVT-1 and checks (Table 6). An average oil yield (kg/h) in IVT and AVT showed that RVT-1 gave 21.33% and 23.49% increase in oil yield (kg/h) over checks PT-303 and Bhawani respectively (Table 7).

Morphologically plants were erect, spreading in nature and matures in 98-105 days. The quantitative characters were recorded and indicated that it had higher no. of primary and secondary branches and more number of seeds/siliqua than checks (Fig.1 and Table 8). Similar results were reported in other study for more number of siliqua/plant, no. of seeds/siliqua and seed index had contributed to enhance seed yield significantly in the selection of genotype[7].

Molecular characterization of RVT-1:

DNA profile of variety Raj Vijay Toria-1 was generated with two control samples of *Brassica juncea* which indicated the different allele sizes and polymorphic bands of the samples by using primers PUT-3, PUT-181, PUT-171, PUT-154 and PUT-173 which was found useful in generating unique profile for Raj Vijay Toria-1 variety when compared to the control samples (Fig. 2 and Table 9). On this basis of developed 30 bands, variety could be identified from other variety.

Thus, the newly developed variety of toria RVT-1 had improved characters which gave high seed yield and oil content which certainly increase farm income of the farmers.

References

1. ANNUAL PROGRESS REPORT (2009-2011) Rapeseed and Mustard, DRMR, Bharatpur (Rajasthan).
2. LUKOWITZ, W., GILLMO, R C.S. AND SCHEIBLE, W. R. (2000) Positional cloning in *Arabidopsis*. Why it feels good to have a genome initiative working for you. *Plant Physiol.* **23** (3) : 795-805.
3. MADSON, E. (1976) Nuclear magnetic resonance spectrometer as a quick method of determination of oil content in rapeseed. *J. Amer. Biochem. Soc*., **53** : 467-469.
4. PANSE, V.G. AND SUKKHATME, P. V. (1954) Statistical Method for Agricultural Workers. ICAR, New Delhi, ppB-17-35.
5. SINGH, M., SWARNKAR, G. B., PRASAD, L. AND RAI, G. (2002) Genetic variability, heritability and genetic advance in Indian Mustard (*Brassica juncea* L. Czern & Coss). *J. Plant Achienes* **2** (1): 27-31.
6. SINGH, P., SINGH, D. N. AND CHAKRABORTY, M. (2003) Variability, heritability and genetic advance in Indian mustard (*Brassica juncea* L.) *J. Res*. **5** (1): 45-57.
7. TIWARI, V. K. (2015) Development of High Seed Yielding and Tolerance to *Alternaria* blight Genotype of Indian mustard (*Brassica juncea* L. Czern & Coss) under rainfed condition. *Nat. Journal of Life Sciences,* **12** (2): 139-142.
8. TIWARI, V. K. (2016) Raj Vijay Mustard-1: An early maturing variety of Indian Mustard (*Brassica juncea* L. Czern & Coss). *New Agriculturist,* **27** (2): 401-406.
9. YADAV, S.K.; YADAVA, D. K.; VASUDEV, S.; YADAV, S.; KUMAR, P.R. AND NIGAM. R. (2013) Assessment of seed quality and oil content in different branches of Indian mustard (*Brassica juncea*) cultivars at different storage intervals. *Indian J. Agri. Sci.*, **83**:227-233.