

GERMPLASM RESOURCES OF OKRA IN ANDAMANS

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Okra (*Abelmoschus esculentus* (L) Moench) holds a prominent position on the vegetable canvas of the Bay Islands. In the present paper, an attempt has been made to document the morpho- physio-agronomical traits of a few germplasm lines which have so far been collected. They have been evaluated and catalogued. One germplasm ANC-1 was found to be a dwarf with extremely short internodes. It has a profuse bearing habit and is a high yielder but it is bottle-necked by photosensitiveness and 'shaddy' looking fruits, and so needs genetic improvement. Another notable germplasm ANC-6, which was found to bear tolerance to multiple diseases viz., *Alternaria* leaf spot, powdery mildew and *Cercospora* leaf spot, may be used in disease resistance breeding programmes. Okra is an important vegetable crop in Andamans probably because of its year round production potentiality in the humid tropics (with about 3000 mm rainfall distributed over 8 months) and being unsuitable for the growth of a number of other vegetable crops especially winter crops. Since long back, a number of okra lines have probably been introduced to these islands which have undergone tremendous selection pressure in this unique climate niche. The present paper describes a few such germplasm which are still growing inspite of the introduction of modern high yielding varieties.

In three consecutive years from 1987-1989, local survey were conducted and germplasm were collected from different parts of Andamans. Collected materials were evaluated during rainy and dry season each year. Standard agronomical protocols were adopted to ensure proper plant growth. Duplicate materials were discarded while growing, on the basis of visual judgment and ultimately 6 lines were identified as separate entry and designated as ANC-1, 2, 3, 4, 5 and 6. Through recurrent evaluation across years, seasons and locality, these materials were characterized in respect of morphological, agronomical,

physiological and biochemical traits. Nitrogen, phosphorus, iron and chlorophyll were estimated as per Yoshida *et al* (1976). Nitrate reductase and IAA oxidase activity measured following Klepper *et al* (1971) and Mahadevan and Sridhar (1982) respectively.

Key morphological characters of 6 indigenous okra germplasm from Bay Islands are summarised in Table 1 alongwith standard check Pusa Sawani for comparison. It reveals that most of the local collections were having vigorous growth habit and lax plant type. ANC-3 and ANC-6 were characterised with

Table 1. Key morphological characters of a few okra germplasm in Andamans

Character	Germplasm						
	ANC-1	ANC-2	ANC-3	ANC-4	ANC-5	ANC-6	Pusa Sawani (check)
Plant Vigour	V	V	Mo	V	Mo	V	Mo
Type	L	L	L	Me	Me	L	C
Stem colour	Gl	G	Gl	Dp	Gl	Pg	G
Leaf							
Shape	Ov	Ov	Ps	Ps	Ov	Ov	Ps
Lobe	Sl	Sl	Dl	Dl	Sl	Sl	Dl
Colour	Lg	Lg	G	G	G	Dg	G
Angle	>45°	>45°	>45°	- 45°	- 45°	>45°	<45°
Blade length	M	M	S	S	M	L	L
Petiole							
Colour	Gl	G	G	Pi	G	Pi	G
Length	B	B	M	S	S	B	S
Stipule size	B	S	B	S	S	M	S
Corolla colour	Ly	Ly	Ly	Lybv	Lybv	Lybv	By
Gynoecium	5c	5c	5c	5c	5c	7c	5c
Fruit size	Sb	Sb	M	M	M	Sb	Nl
Colour	Lg	Dg	G	Dp	G	Dg	G
Ridges	8	7-8	5	5	5m	7, 8, 9	5

1a. V = Vigorous, Mo = Moderate. 1b. L = Lax, Me=medium, c=Compact. 2. Gl = Light green, G = green, Dp = Deep pink, Pg = Pinkish green. 3a. Ov = ovate, PS = Pusa Sawani type. 3b. Sl = Slightly lobed, Dl = Deeply lobed. 3c. Lg = Light green, G = green, Dg = deep green. 3e. L = Long > 24.33 cm, M = medium, = 21.67-24.33cm, S = small < 21.66 cm. 4a. Gl = Light Green, G = green, Pi = Pinkish. 4b. B = Big > 26.1 cm, M = medium = 23.6-26.1 cm, S = small < 23.5 cm. 5. B = Big > 1.74 cm, M = Medium = 1.24-1.47 cm, S = Small < 1.23cm. 6. Lybv = Light yellow coloured with violet base, By = Bright yellow, LKy = Light yellow. 7. C = Chambered. 8a. Sb = Short bold, M = Medium, Nl = Narrow long. 8b. Lg = Light green, G = Green, Dg = Dark green, Dp = Deep purple.

deep pink and pinkish green coloured stem respectively while others were green or light green. Except ANC-3 and 4, all the accessions were having slightly lobed ovate type of leaves while others had typical Pusa Sawani type leaf with deep lobes. Regarding leaf colour, ANC-1 and ANC-4 bore light green leaves while ANC-6 had deep green and the rests were having green coloured leaves. Leaf angle to stem in the local varieties were mostly more than 45 except ANC 4 and 5 where the angle was about 45. Leaf blade-length were small to moderate in the local collections. ANC-4 and ANC-6 had pink coloured petiole while remaining strains had green or light green. Regarding petiole length and stipule size, notable variability observed as they ranged from small to big size in the local strains.

Corolla colour were mostly light yellow. ANC-4 and ANC-6 had light yellow coloured corolla with pink base. Except ANC-6 ANC1, 2 and 6 had short bold type of fruits and ANC-3, 4 and 5 were found to bear medium type of fruits in comparison to narrow long fruits of Pusa Sawani. Deep purple coloured fruit was found to be a diagnostic character of ANC-4 whereas in ANC-1, fruits were light green shabby looking. ANC-3 and 4 had green and ANC-2 and 6 had deep green fruits. Remarkable variability for number of ridges (5-9) within these germplasm ANC-1, 2 and 6 had more than 5 number of ridges as shown by the rests.

During the dry season, much differences were not observed for days to flower initiation among the local strains (Table 1) but all of them took more days from initial flowering to attain 50 per cent flowering than the check Pusa Sawani. In the rainy season, days to initial and 50 per cent flowering shown tremendous variation due to photosensitive nature of ANC -1, 2, 5 and 6. ANC - 3 and 4 took 5-6 days moe for initial flowering in comparison to dry season. Anc-1 and 6 were found dwarf while the others were much more taller across seasons. Stem girth and number of primary branches per plant were much more taller across seasons. Stem girth and number of primary branches per ploant were much more in local grmplasm than Pusa Sawani. Regarding average internode length ANC-1 and ANC 6 had very short internodes (2.8-4.5 cm). ANC-1, 3 and 5 gave the first branch at a distance more closure to the ground. Number of fruiting nodes and fruits per plant found maximum in ANC-1. Long fruits were found to be the characteristic of ANC 3, 4 and 5 while thick fruits were characteristics of ANC-1, 2 and 6 as evidenced from width of fruit data. Fruit yield found maximum in ANC 1, lowest in ANC-6. The yield of ANC-1 found as good as check Pusa Sawani.

To have a successful crop, heat tolerance is an essential character under the rainfed cultural condition of Bay Islands during the dry season. ANC-1 was found to be not affected due to excessive heat generated during mid day with clean sky. Thick leaves of ANC-1 articulated with strong veins probably attributed to the tolerance norms. Regarding photosensitivity among the local

Table 2. Agronomical traits of a few okra germplasm in Andamans

Character	Season	Germplasm designation						Pusa Sawani (Check)
		ANC-1	ANC-2	ANC-3	ANC-4	ANC-5	ANC-6	
Days to initial flowering	D*	41.2	43.0	42.2	46.0	41.2	43.0	41.0
	R	110.0	92.3	50.0	51.0	99.8	100.0	44.3
Days to 50% flowering	D	53.2	49.0	48.0	51.0	45.3	49.0	46.0
	R	117.0	99.0	56.8	55.0	106.3	106.0	49.0
Plant height (cm)	D	61.4	89.5	155.2	166.6	165.4	91.4	147.8
	R	71.7	164.0	167.1	171.5	168.1	114.3	164.7
Plant Spread (cm)	D	95.1	89.4	56.0	70.0	72.0	75.0	51.4
	R	108.7	103.8	62.8	77.8	84.8	89.2	53.6
Stem girth (cm)	D	3.2	2.5	3.0	2.0	3.0	4.3	1.8
	R	3.0	2.8	3.3	2.30	3.1	4.1	2.0
No. of primary branches/Plant	D	5.7	2.2	2.0	1.2	4.2	3.0	1.0
	R	5.8	2.0	2.0	1.1	4.5	3.3	1.2
Average internode length (cm)	D	2.8	6.0	12.0	11.7	6.0	3.3	10.9
	R	3.2	8.3	14.2	12.5	8.5	4.5	13.2
Height of first branch from ground level (cm)	D	3.1	5.0	3.5	8.0	4.2	10.0	13.2
	R	2.6	6.3	4.6	8.9	6.2	13.6	11.6
No. of fruiting nodes/plant	D	11.2	10.2	9.8	10.2	8.9	10.5	12.2
	R	13.8	11.6	10.0	12.3	9.8	12.3	13.0
No. of fruits/Plant	D	10.9	7.4	8.0	8.1	8.1	6.3	10.3
	R	12.6	8.5	8.2	8.9	7.8	5.9	9.7
Length of fruit (cm)	D	13.6	12.7	19.7	15.4	18.0	9.1	17.8
	R	2.5	2.3	2.0	1.8	2.0	3.0	1.8
Fruit Yield /Plant (g)	D	201.2	170.9	135.7	149.0	156.6	87.6	206.2
	R	179.7	195.5	187.7	133.5	154.5	75.3	190.0

*D = Dry, R = Rainy

strains ANC-1, 2, 5 and 6 were found photosensitive (Table 3). While computing fruit harvest indice in comparism to check Pusa Sawani all the local collections were having lower values, amongst which ANC-4 scored maximum and ANC-6 scored minimum values. It also indicates inefficient translocation of nutrients from vegetative parts to the fruits among the local strains.

Table 3. Important physiological traits in okra collections from Bay islands

Designation	Heat tolerance (0-9 Scale)*	Photosensitivity	Fruit Harvest index (%)
ANC -1	0*	+**	32.93
ANC -2	5		33.05
ANC -3	9	-	30.95
ANC -4	3	-	41.96
ANC -5	3		36.87
ANC -6	5		23.46
Pusa Sawani (Check)	3	-	53.41

* Value scored on the basis of leaf wilting at mid day.

0 = Not affected, 3 = Mild affected 5 = Moderately affected, 9 = Severly affected.

** , + Photosensitive , - Not photosensitive

Studies made with a few representatives of local germplasm and check Pusa Sawani with special reference to some specific physiological and biochemical parameters (Table 4). It reveals that largest leaf area encountered in ANC-1. But it possessed low chlorophyll content. Nitrate reductase activity, IAA oxidase activity, nitrogen harvest index and phosphorus harvest index were found highest in ANC-4 among the local accessions. To the contrary of the above mentioned characters iron harvest index was found more in the local accessions than check Pusa Sawani.

Table 4. Specific physiological and biochemical parameters of a few Okra

Germplasm designation	leaf area/plant (cm)	Total chlchlorophyll content (mg/g)	Nitrate reductase activity (n. moles nos/g/hr)	IAA oxidase activity (mg IAA oxid/g/hr)	Nitrogen harvest index (%)	Phosphorus harvest index (%)	Iron harvest index (%)
ANC-1	2270	1.32	3455	39.5	60.6	48.8	31.3
ANC-2	1838	1.32	2385	32.0	63.6	49.4	33.9
ANC-4	1815	1.50	4742	43.5	67.7	57.0	33.2
Pusa Sawani (Check)	1754	1.55	4393	43.5	76.1	60.6	29.4

In nutshell, it may be concluded that significant variation was observed in respect of morphological agronomical, physiological and biochemical parameters amongst the indigenous collections of okra in Bay Islands. ANC-1 bears enormous potentiality in vegetable production in Andamans as it is high yielding heat tolerant and with dwarf plant type though bottlenecked with strong photosensitivity, short bold light green shabby fruits, sreaded plant type and with lower harvest index. It will be more logical to launch a massive breeding programme to eliminate such unwanted traits for improvement of this local variety which seemed to have progressed under many years selection pressure under this humid tropics of climate. Another germplasm ANC-6 was found to have multitolerance to alternaria leaf spot, powdery mildew and cercospora leaf spot which offers an opportunity in its exploitation in disease resistance breeding programme.

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