

SEASONAL EVALUATION OF CAPSICUM SPECIES AND CULTIVARS FOR OLEORESIN RECOVERY

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Abstract : Evaluation of nine chilli genotypes for oleoresin recovery under three different seasons identified Arka Lohit as the highest yielder of oleoresin. Genotypes were higher in oleoresin content during winter. Considering the fruit yield and oleoresin recovery together, summer was the best season for oleoresin yield.

Key words: Capsicum, oleoresin, seasonal evaluation, yield

INTRODUCTION

There exists considerable variability in chilli cultivars in respect of yield and quality of oleoresin (Mathew *et al.*, 1971; Lewis, 1972; Pradeepkumar, 1990). In addition, the oleoresin recovery was influenced by the geographical origin of the sample, climatic condition, harvest maturity, post-harvest operations etc. (Menon, 1995). Generating information about the oleoresin yield of various chilli species and cultivars and finding out the best season of cultivation for maximum oleoresin recovery would be helpful for farmers to fetch more income. The present study was undertaken to evaluate different capsicum species and cultivars for oleoresin recovery with respect to different seasons.

MATERIALS AND METHODS

The influence of season on oleoresin yield was studied in the nine chilli genotypes presented in Table 1. The genotypes were evaluated in three seasons viz., summer (S₁, Jan-March), rainy (S₂, May-July) and winter (S₃, Sept-Nov). The experiment was laid out in RBD with 27 treatments and three replications at the Department of Olericulture, College of Horticulture, Vellanikkara, Trichur during the period from 1993-1996. The plot size was 3.6 x 2.7 m² with 48 plants, spaced at 45 x 45 cm. All operations were carried out as per package of practice recommendations of the Kerala Agricultural University (KAU, 1993). Observations were recorded on days to flower, days to fruit set, days to harvest, number of fruits per plant, fruit yield per plant and oleoresin yield.

RESULTS AND DISCUSSIONS

Pooled analysis of variance over seasons showed that the season x cultivar interaction was significant for all the characters. Mean performance of cultivars for the characters over seasons is presented in Tables 2, 3 and 4.

Days to flower, fruit-set and harvest

Ujwala, a variety released from the Kerala Agricultural University, was the earliest to flower (75.78 days) and CA 645 lagged behind all other cultivars (118.33 days). The genotypes were late in winter (104.26 days). No significant difference was noticed for the days taken to first flowering between summer and rainy seasons. Ujwala was the earliest genotype (91.11 days) to set fruits and CA 645 was the late (132.11 days). With regard to season, genotypes took more days to fruit set in winter (118.2 days) than in rainy (112.48 days) and summer (109.6 days). CA 653 took maximum (171.11) and KTPL-19 minimum days (130.78) to harvest irrespective of season. With regard to season, the genotypes took more days to harvest during winter (158.51) than in summer (151.18 days) and rainy (146.17) seasons. The varieties were generally late in winter. Though winter in Kerala is not as distinct as in other temperate regions, the days are comparatively longer and warmer during summer months. The carbohydrate accumulation will be generally more during longer day of the summer and less amount will be utilized in respiration during short nights.

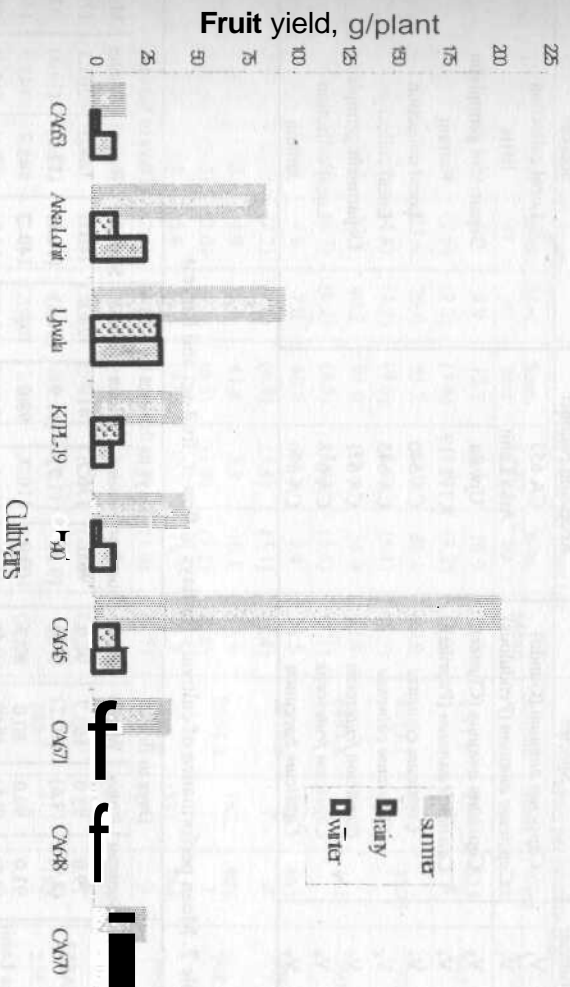


Fig. 1. Performance of cultivars for fruit yield

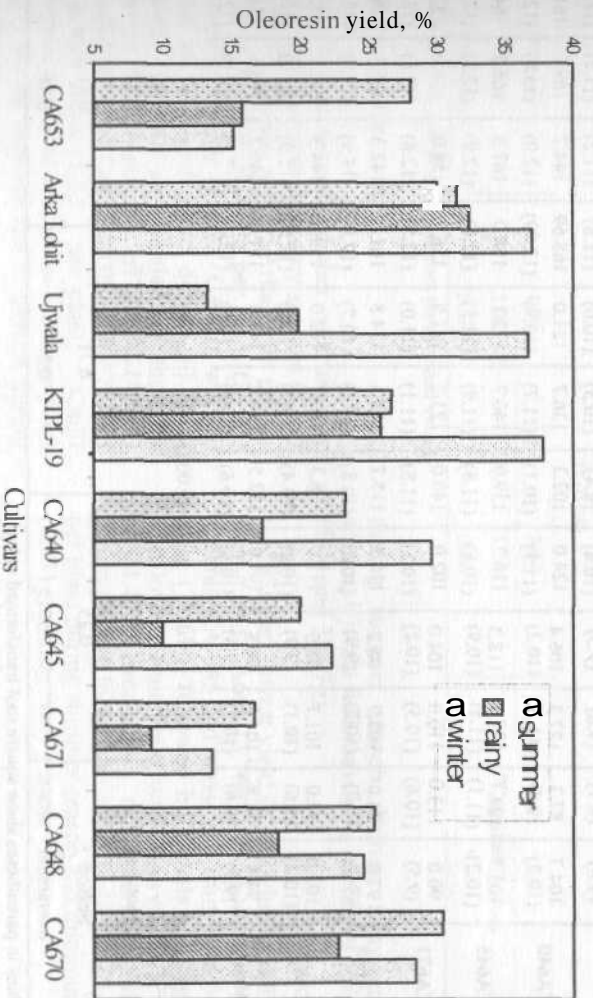


Fig. 2. Performance of cultivars for oleoresin recovery

Table 1. Chilli genotypes selected for the study

Number	Species	Accession Number	Sources
V ₁	<i>Capsicum annuum</i> (Gundu)	CA 653	Local collection
V ₂	<i>Capsicum annuum</i> (Pendulous)	Arka Lohit	IIHR
V ₃	<i>Capsicum annuum</i> (Cluster)	Ujwala	Department germplasm
V ₄	<i>Capsicum annuum</i> (Paprika)	KTPL-19	Katrain
V ₅	<i>Capsicum chinense</i>	CA 640	Local collection
V ₆	<i>Capsicum chinense</i>	CA 645	Local collection
V ₇	<i>Capsicum frutescens</i>	CA 671	Department germplasm
V ₈	<i>Capsicum frutescens</i>	CA 648	Local collection
V ₉	<i>Capsicum baccatum</i>	CA 670	Jammu

Table 2. Mean performance of cultivars for days to flower, fruit-set and harvest

Genotype	Days to flower				Days to fruit-set				Days to harvest			
	Summer	Rainy	Winter	Mean	Summer	Rainy	Winter	Mean	Summer	Rainy	Winter	Mean
CA653	79.0 (8.9)	93.0 (9.6)	103.7 (10.2)	91.9 (9.6)	96.0 (9.8)	136.7 (11.7)	141.7 (11.9)	124.8 (11.1)	140.0 (11.8)	168.0 (12.9)	205.3 (14.3)	171.1 (13.0)
Arka Lohit	93.0 (9.6)	90.0 (9.5)	80.0 (8.9)	87.7 (9.4)	103.0 (10.2)	110.0 (10.5)	98.0 (9.9)	103.7 (10.2)	140.7 (11.9)	145.7 (12.1)	147.7 (12.2)	144.7 (12.0)
Ujwala	84.0 (9.2)	54.7 (7.4)	88.7 (9.4)	75.8 (8.6)	107.0 (10.3)	71.7 (8.5)	94.7 (9.7)	91.1 (9.5)	134.7 (11.6)	121.3 (11.0)	146.0 (12.1)	134.0 (11.6)
KTPL-19	95.0 (9.8)	78.7 (8.9)	95.7 (9.8)	89.8 (9.5)	107.7 (10.4)	88.7 (9.4)	106.7 (10.3)	101.0 (10.0)	140.0 (11.8)	126.3 (11.2)	126.0 (11.2)	130.8 (11.4)
CA640	104.7 (10.2)	87.3 (9.4)	127.3 (11.3)	106.4 (10.3)	124.0 (11.1)	102.3 (10.1)	136.7 (11.7)	121.0 (10.9)	168.69 (12.99)	144.7 (12.0)	169.7 (13.0)	161.0 (12.7)
CA645	103.7 (10.2)	123.7 (11.1)	127.7 (11.3)	118.3 (10.9)	116.7 (10.8)	139.0 (11.8)	140.7 (11.9)	132.1 (11.5)	158.0 (12.6)	167.3 (12.9)	168.0 (12.3)	164.4 (12.6)
CA671	90.0 (9.5)	113.0 (10.6)	110.0 (10.5)	104.0 (10.2)	102.0 (10.1)	140.0 (11.8)	123.7 (11.1)	121.9 (11.0)	156.7 (12.5)	158.0 (12.6)	159.0 (12.6)	157.9 (12.6)
CA648	97.0 (9.9)	94.0 (9.7)	103.7 (10.2)	98.2 (9.9)	115.3 (10.7)	115.7 (10.8)	113.3 (10.6)	114.8 (10.7)	161.0 (12.8)	142.3 (11.9)	165.3 (12.9)	156.9 (12.5)
CA670	103.0 (10.2)	92.0 (9.6)	101.7 (10.1)	98.9 (9.9)	117.0 (10.8)	108.3 (10.4)	110.7 (10.7)	112.0 (10.6)	159.0 (12.6)	144.3 (12.0)	162.0 (12.7)	155.1 (12.5)
Mean	94.4 (9.7)	91.8 (9.6)	104.3 (10.2)	96.8 (9.8)	109.6 (10.5)	112.5 (10.6)	118.2 (10.9)	113.4 (10.7)	151.2 (12.3)	146.2 (12.2)	158.5 (12.6)	151.9 (12.3)
CD (0.005)												
Genotypes		0.60		1.23		1.53						
Season		0.35		0.71		0.31						
Interaction		0.50		0.28		0.31						

Values in parentheses show square root transformed values

Consequently, more amount of carbohydrate will be available for growth and development under the warm humid conditions of Kerala, favouring the flowering and fruit-set of tropi-

cal crops like chilli. The results reported by Balbaa *et al.* (1968) and Rylski (1972) provide evidence for the faster rate of growth in summer plants than in winter plants.

Table 3. Mean performance of cultivars for yield of fruits

Geno- type	Fruits per plant				Fruit yield per plant (g)				Fruit yield per hectare (kg)*				
	Sum- mer	Rain- y	Wint- er	Mea- n	Sum- mer	Rainy	Win- ter	Mean	Summe- r	Rain- y	Wint- er	Mean	
CA653	5.0 (2.2)	3.0 (1.7)	6.7 (2.6)	4.9 (2.2)	12.7 (3.6)	3.3 (1.8)	10.9 (3.2)	9.0 (2.9)	627.2	164.4	535.8	442.5	
Arka Lohit	51.7 (7.2)	11.9 (3.5)	23.4 (4.8)	29.0 (5.2)	81.7 (9.0)	12.0 (3.5)	26.4 (5.1)	40.0 (5.9)	4033.1	591.6	1305	1976	
Ujwala	68.7 (8.3)	29.7 (5.5)	22.3 (4.7)	40.2 (6.2)	91.0 (9.5)	33.4 (5.8)	34.0 (5.8)	52.8 (7.1)	4493.8	1649.4	1677	2606	
KTPL- 19	11.3 (3.4)	4.9 (2.2)	4.8 (2.2)	7.0 (2.6)	40.9 (6.4)	14.2 (3.8)	9.4 (3.1)	21.5 (4.4)	2019.8	702.7	463.2	1061	
CA640	8.3 (2.9)	3.0 (1.7)	4.0 (2.0)	5.1 (2.2)	41.8 (6.5)	3.3 (1.8)	10.1 (3.2)	14.6 (3.8)	2064.2	162.5	499.3	908.6	
CA645	53.0 (7.3)	5.3 (2.3)	5.6 (2.4)	21.3 (4.0)	197.8 (14.1)	10.8 (3.3)	15.5 (3.9)	74.7 (7.1)	9769.9	531.4	764.0	3688	
CA671	30.0 (5.5)	5.1 (2.3)	5.0 (2.2)	13.4 (3.3)	34.8 (5.9)	2.4 (1.5)	4.3 (2.1)	13.8 (3.2)	1718.5	117.0	213.8	683.0	
CA648	5.6 (2.4)	4.2 (2.1)	4.0 (2.0)	4.6 (2.1)	5.3 (2.3)	4.4 (2.1)	3.8 (1.9)	4.5 (2.1)	263.7	215.8	185.7	221.7	
CA670	2.8 (1.7)	1.4 (1.2)	1.3 (1.1)	1.8 (1.3)	21.6 (4.7)	5.1 (3.0)	7.7 (2.7)	12.8 (3.5)	1067.2	250.4	380.2	631.6	
Mean	26.3 (4.5)	7.6 (2.5)	8.6 (2.7)	14.2 (3.8)	58.6 (6.9)	10.3 (2.9)	13.6 (3.5)	27.5 (5.2)	2895.3	509.1	669.1	1358	
CD (0.05)													
Genotypes				1.80					3.04				
Season				1.02					1.80	*Calculated values			
Interaction				0.33					0.40				

Values in parentheses show square root transformed values

Fruits per plant

Ujwala had maximum number of fruits per plant during summer and rainy seasons (68.67 and 29.67). During winter, Arka Lohit produced more number of fruits per plant (23.43) followed by Ujwala (22.33). CA 670 was the lowest in fruits per plant during all these seasons. In general, Ujwala was the best genotype for production of fruits (40.22) followed by Arka Lohit (29.0). CA 670 had the lowest fruits (1.83) per plant. Chilli genotypes produced maximum fruits per plant (26.27) during summer and minimum during rainy season (7.63).

Fruit yield per plant

Fruit yield per plant was maximum (197.84g) for CA 645 and minimum for CA 648 (5.34g)

during summer season. During rainy and winter, Ujwala had maximum yield per plant (33.4 and 33.97g).

CA 671 had lowest yield (2.37g) during rainy season and CA648 (3.76g) during winter. In general, CA 645 had maximum fruit yield per plant (74.69g) followed by Ujwala (52.79g). The lowest fruit yield was observed in CA 648(4.49g) irrespective of season. Chilli genotypes produced maximum yield (58.63g) per plant during summer season and minimum (10.31g) during rainy season.

Oleoresin yield

Significant difference was noticed among genotypes and seasons for oleoresin yield. CA 670 gave maximum percentage of oleoresin (30.4%) during summer and Ujwala,

the minimum (13.33%). During rainy season, maximum percentage of oleoresin was produced by Arka Lohit (32.43) followed by KTPL-19 (25.87). KTPL-19 had the highest

oleoresin percentage (37.83) during winter, followed by Arka Lohit (37.0). CA 671 was poor in oleoresin during rainy and winter seasons (9.2 and 13.63%). In general, Arka

Table 4. Mean performance of cultivars oleoresin yield

Genotype	Yield of oleoresin (%)				Yield of oleoresin per hectare (kg)*			
	Summer	Rainy	Winter	Mean	Summer	Rainy	Winter	Mean
CA653	28.1 (5.3)	15.8 (4.0)	15.2 (3.8)	16.9 (4.3)	37.0	5.6	17.3	15.9
Arka Lohit	30.0 (5.4)	32.4 (5.7)	37.0 (6.1)	33.1 (5.7)	272.2	43.6	109.1	147.6
Ujwala	13.3 (3.6)	19.9 (4.5)	36.7 (6.0)	23.3 (4.7)	121.6	67.8	125.5	126.6
KTPL-19	26.7 (5.0)	25.9 (5.1)	37.8 (6.1)	30.1 (5.4)	107.7	38.2	35.8	64.9
CA640	21.3 (4.8)	17.3 (4.2)	29.6 (5.4)	23.4 (4.8)	96.8	5.9	30.0	42.9
CA645	20.0 (4.4)	10.0 (3.2)	22.3 (4.7)	17.4 (4.1)	392.7	11.2	35.0	129.8
CA671	16.7 (4.0)	9.2 (3.0)	13.6 (3.7)	13.2 (3.6)	63.0	2.4	13.4	19.8
CA648	25.4 (5.0)	18.4 (4.3)	24.6 (4.9)	22.9 (4.8)	14.7	9.1	14.0	12.6
CA670	30.4 (5.5)	22.8 (4.8)	28.4 (5.3)	27.2 (5.2)	61.3	10.9	20.5	29.1
Mean	23.8 (4.9)	19.1 (4.4)	27.2 (5.2)	23.4 (4.9)	141.8	19.5	33.7	65.6
CD (0.05)								
Genotypes			0.56					
Season			0.32			*Calculated values		
Interaction			1.85					

Values in parentheses show square root transformed values

Lohit and KTPL-19 were on par (33.14 and 30.12%) in oleoresin content. Considering the yield and oleoresin content together, Arka Lohit, a pendulous *Capsicum annum* variety could be ranked first for oleoresin yield per unit area. The total oleoresin yield in Ujwala was third in ranking considering three seasons which is next to Arka Lohit and CA 645. Excluding summer, Ujwala was exceedingly superior in fruit and total oleoresin yield per plant. CA 671 was the poorest oleoresin yielder (13.17%) irrespective of season. With regard to seasons, the genotypes grown during winter had maximum oleoresin (27.24%) followed by summer (23.75%) and rainy

season (19.13%). But with respect to yield per plant, genotypes were generally superior in summer. Considering the fruit yield and oleoresin content together, summer was the best season for total oleoresin yield per unit area. The poor oleoresin content in summer was compensated by the higher yield. This is in accordance with Waller and Nowacki (1975) who found that the increased alkaloid content was seen under climatic conditions of water stress.

ACKNOWLEDGEMENT

This paper forms a part of the Ph.D thesis of

the senior author submitted to the Kerala Agricultural University.

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