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Variations in Pumpkin (*Cucurbita moschata* Duch. ex Poir.) Landraces for Earliness, Yield and Quality Attributes in North East India

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ABSTRACT

Keywords

Earliness, Pumpkin,
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The present study was carried out to evaluate the mean performance of pumpkin genotypes for growth, yield and quality attributes. Genotypes were collected from various places of North Eastern Region of India and laid out in Randomized Completely Block Design (RCBD) with three replications. The analysis of variance in the present investigation revealed significant differences among 25 pumpkin genotypes for all the studied traits. On the basis of mean performance, the genotype CHFPUM-24 (Landrace from Tripura) was found good for earliness and growth. The genotype CHFPUM-16 (landrace from Imphal, Manipur) was found to be superior for the yield attributing characters while CHFPUM-1 (landrace from Pasighat, Arunachal Pradesh) was found good for fruit quality. So, these genotypes can be used as parental source in future breeding programme.

Introduction

Pumpkin (*Cucurbita moschata* Duch. ex Poir.) is one of the most important cucurbitaceous vegetable crops grown extensively in tropical and sub-tropical parts of the country. Pumpkin is also known as Kashiphal or Sitaphal or Lal Kaddu. It is great significance due to its high carotene content and long shelf life, long period of availability, excellent response to vegetable forcing, high nutritive estimates and better transport qualities. Archeological evidences suggest that *Cucurbita moschata* was widely distributed in America, Mexico and Peru being the primary center of origin. The name pumpkin originated from Greek

word 'Pepon' used for long melon (Bahadur and Singh, 2014).

The flowers are used for excellent preparation so called 'pakora'. The flowers of pumpkin are more nutritive than fruits (Rana 2014). Pumpkin fruits are rich in vitamins, particular in precursor of vitamin A, and minerals. The edible portion of pumpkin constitutes around 80 %. Pumpkin seeds contain 40.27 % protein, 34.59 % crude fibre, and 4.45 % ash. Oleic, linoleic and palmitic acids are the predominant fatty acid in seed oil. Glutamic acid, arginine, glycine and aspartic acid are the most abundant amino acids (Aboul-Nasr *et al.* 1997). The main nutrients are lutein and both

alpha and beta carotene, the latter of which generates vitamin A in the body (Ahmed *et al.*, 2011).

Pumpkin has received little attention in crop improvement, as compared to other *Cucurbitaceous* vegetables. Since ancient times, a wide number of germplasms are available, conscious evaluation and exploitation of germplasm has not been attended until recently. This is very helpful for a plant breeder in developing a commercial variety with market preference by determining the component characters on which selection can be exercised based on the improvement in yield and quality Tamilselvi and Jansirani (2017). Preliminary identification of early maturing genotypes can be done based on characters like days to first opening of staminate flower and female flower, node number to first male and female flowering appearance and days to fruit harvest, number of fruits per plant, average fruit weight and fruit yield per plant.

Materials and Methods

Experimental material and site

The present experiment was conducted at Vegetable Research Farm, College of Horticulture and Forestry, Central Agricultural University, Pasighat, East Siang, Arunachal Pradesh, India during March 2017. The experimental material for the present study consisted of 25 diverse genotypes of pumpkin (*Cucurbita moschata* Duch. ex. Poir.) including two check varieties *viz.*, CHFUM-7 (Kashi Harit) and CHFUM-23 (Narendra Agrim) were collected from North Eastern Region of India (Table 1).

The experiment was laid out in Randomized complete block design (RCBD) with three replications. Under each genotype 10 plants were sown per replication with spacing of

3×1.3 m². The standard cultural practices as mentioned in Package of Practices for Vegetable Crops (Rana. 2014). The observations were recorded from five randomly selected plants for growth, Yield and quality parameters.

Statistical analysis

Analysis of variance of the data from each attribute was computed by using the OPSTAT computer program. For significant result mean separation was carried out using least significant difference at 5 per cent level of probability (Gomez and Gomez 1984).

Results and Discussion

Morphological characters

The genotypes showed significant variation for all the studied characters. Earliness is considered as desirable traits in cucurbits which is measured as the days taken for first female flower appearance and node number for first female flower appearance. Minimum days taken to first staminate flower anthesis was observed in the genotype CHFUM-15 (58.53 days) followed by CHFUM-14 (58.83 days) and CHFUM-4 (58.87 days) while days taken to first pistillate flower anthesis was observed in CHFUM-5 (62.00 days) followed by CHFUM-23 (62.30 days) and CHFUM-19 (62.53 days) (Table 2). Similar result was reported by Tamilselvi and Jansirani (2017).

Earliness is also measured in node at which first male and female flower appears. Staminate flower first appeared in CHFUM-24 (2.73), followed by CHFUM-20 and CHFUM-21 while first pistillate flower was observed in CHFUM-24 (10.43) followed by CHFUM-14 and CHFUM-20 (Table 2). The result was in conformity with the finding of Venkatesan *et al.*, (2016) in muskmelon.

Early harvest is also one of the important desirable traits for crop improvement. The pumpkin fruits first matured in genotypes CHF PUM-21 (79.20 days) followed by CHF PUM-23 (81.10 days) and CHF PUM-24 (81.30 days). Similar result was obtained by the (Venkatesan *et al.*, 2016) in muskmelon (Table 2).

Yield contributing characters

The maximum polar circumference was recorded in CHF PUM-20 (68.93) which was statistically at par with CHF PUM-10,

CHF PUM-23 and CHF PUM-6 (Table 2). The highest equatorial circumference of fruit was obtained from CHF PUM- 23 (73.80) followed by CHF PUM-10 (67.93) and CHF PUM-21 (64.13) whereas lowest was found in CHF PUM-16 (33.93). Similar results were also reported by the (Ahmed *et al.*, 2011) (Table 3). Fruit flesh thickness is a desirable trait in pumpkin and maximum flesh thickness was found in genotypes CHF PUM-12 (5.16) followed by CHF PUM-17(4.76), CHF PUM-3 and CHF PUM-4 (4.50). Similar results reported by the (Tamilselvi and Jansirani, 2017) (Table 3).

Table.1 List of pumpkin genotypes with their sources of collection

S. N.	Genotype	Source	Coordinates of the places
1.	CHF PUM-1	A Landrace of Pasighat, Arunachal Pradesh	28.07° N, 95.33° E
2.	CHF PUM-2	A landrace of Pasighat, Arunachal Pradesh	28.07° N, 95.33° E
3.	CHF PUM-3	A landrace of Pasighat, Arunachal Pradesh	28.07° N, 95.33° E
4.	CHF PUM-4	A landrace of Pasighat, Arunachal Pradesh	28.07° N, 95.33° E
5.	CHF PUM-5	A landrace of Pasighat, Arunachal Pradesh	28.07° N, 95.33° E
6.	CHF PUM-6	A landrace of Pasighat, Arunachal Pradesh	28.07° N, 95.33° E
7.	CHF PUM-7	A landrace of IIVR, Varanasi (U.P.)	25.28° N, 82.96° E
8.	CHF PUM-8	A landrace of Pasighat, Arunachal Pradesh	28.07° N, 95.33° E
9.	CHF PUM-9	A landrace of Pasighat, Arunachal Pradesh	28.07° N, 95.33° E
10.	CHF PUM-10	A landrace of Ziro, Arunachal Pradesh	27.56° N, 93.83° E
11.	CHF PUM-11	A landrace of Aizwal, Mizoram	23°43'38" N, 92°43'4" E
12.	CHF PUM-12	A landrace of Aizwal, Mizoram	23°43'38" N, 92°43'4" E
13.	CHF PUM-13	A landrace of Aizwal, Mizoram	23°43'38" N, 92°43'4" E
14.	CHF PUM-14	A landrace of Aizwal, Mizoram	23°43'38" N, 92°43'4" E
15.	CHF PUM-15	A landrace of Imphal, Manipur	24.80° N, 93.93° E
16.	CHF PUM-16	A landrace of Imphal, Manipur	24.80° N, 93.93° E
17.	CHF PUM-17	A landrace of Imphal, Manipur	24.80° N, 93.93° E
18.	CHF PUM-18	A landrace of Gangtok, Sikkim	27.33° N, 88.62° E
19.	CHF PUM-19	A landrace of Gangtok, Sikkim	27.33° N, 88.62° E
20.	CHF PUM-20	A landrace of Kohima, Nagaland	25.67° N, 94.10° E
21.	CHF PUM-21	A landrace of Kohima, Nagaland	25.67° N, 94.10° E
22.	CHF PUM-22	A landrace of Kohima, Nagaland	25.67° N, 94.10° E
23.	CHF PUM-23	A landrace of NDUAT, Faizabad (U.P.)	26.77° N, 82.14° E
24.	CHF PUM-24	A landrace of Agartala, Tripura	23.84° N, 88.62° E
25.	CHF PUM-25	A landrace of Agartala, Tripura	23.84° N, 88.62° E

Table.2 Morphological characters of 25 pumpkin germplasm

Sl. No.	Charectes	Vine length	Number of primary branches per plant	Days to first male flower anthesis	Days to first female flower anthesis	Node bearing first male flower	Node bearing first female flower	Days to first fruits harvest	Nimber of fruits per plant	Polar circumferences
1.	CHFPUM-1	11.00	10.53	62.97	66.17	6.33	11.33	88.87	3.37	62.67
2.	CHFPUM-2	7.10	13.63	63.50	70.73	5.63	12.30	103.33	3.73	52.90
3.	CHFPUM-3	8.10	11.97	59.10	63.40	3.73	12.10	87.60	2.90	55.10
4.	CHFPUM-4	7.07	12.33	58.87	66.33	4.40	14.00	89.67	2.33	60.13
5.	CHFPUM-5	6.70	9.53	60.53	62.00	5.07	12.00	86.67	2.07	50.00
6.	CHFPUM-6	8.50	11.10	62.07	67.73	5.00	13.60	91.43	2.87	66.10
7.	CHFPUM-7	7.33	11.53	61.73	64.63	3.77	12.20	87.03	1.63	52.30
8.	CHFPUM-8	7.77	8.07	61.10	63.87	3.53	13.33	87.63	2.77	41.93
9.	CHFPUM-9	7.40	10.97	60.73	63.53	3.73	12.10	89.10	3.13	51.00
10.	CHFPUM-10	7.88	9.67	63.40	70.20	4.73	12.83	93.40	2.90	67.63
11.	CHFPUM-11	7.20	11.33	63.07	69.07	4.73	12.27	93.43	2.80	57.30
12.	CHFPUM-12	11.37	11.97	62.10	66.53	3.53	11.77	90.20	1.43	63.80
13.	CHFPUM-13	7.90	8.10	59.73	63.97	3.30	12.13	82.00	3.40	63.60
14.	CHFPUM-14	6.70	9.53	58.83	62.73	3.63	10.77	81.40	1.87	56.80
15.	CHFPUM-15	7.67	10.07	58.53	63.53	4.43	12.07	82.37	2.60	55.63
16.	CHFPUM-16	7.90	11.73	59.73	65.00	4.50	11.37	85.00	3.57	64.13
17.	CHFPUM-17	8.57	10.83	61.20	64.87	3.33	13.33	85.20	2.50	58.73
18.	CHFPUM-18	6.83	10.97	63.43	70.10	3.30	11.87	91.10	2.63	58.00
19.	CHFPUM-19	6.57	9.00	59.40	62.53	3.93	14.13	86.27	3.57	64.93
20.	CHFPUM-20	6.90	11.10	62.77	63.73	3.00	11.20	82.70	2.00	68.93
21.	CHFPUM-21	7.07	11.53	62.07	63.53	3.20	11.83	79.20	2.10	59.00
22.	CHFPUM-22	6.37	12.73	62.43	66.20	3.73	12.73	82.20	2.40	56.93
23.	CHFPUM-23	7.03	11.17	60.97	62.30	3.97	14.33	81.10	2.70	66.80
24.	CHFPUM-24	6.60	11.67	62.87	64.63	2.73	10.43	81.30	2.13	63.63
25.	CHFPUM-25	7.27	12.87	60.63	63.17	3.97	12.10	84.50	3.13	52.80
	Mean	7.63	10.96	61.27	65.22	4.04	12.33	86.91	2.66	58.83
	CV%	8.74	10.15	2.09	2.11	17.93	10.11	2.76	9.21	4.29
	SE_{+m}	0.38	0.64	0.74	0.79	0.41	0.71	1.38	0.14	1.45
	LSD (5%)	1.09	1.82	2.10	2.26	1.19	2.04	3.94	0.40	4.14
	Minimum	6.3667	8.06	58.53	62.00	2.73	10.43	79.20	1.43	41.93
	Maximum	11.36	13.63	63.50	70.73	6.33	14.33	103.33	3.73	68.93

Table.3 Yield contributing characters of 25 genotypes of pumpkin

Sl. No.	Charectes	Equatorial circumferences	Flesh thickness	Cavity length	Number of seeds per fruit	100 seed weight (g)	Average fruit weight (kg)	Fruit yield per plant (kg)	Fruit yield per hectare (q)
1.	CHFPUM-1	37.80	2.77	18.57	209.67	9.67	1.57	4.97	212.20
2.	CHFPUM-2	51.50	3.23	7.77	318.33	8.20	1.37	5.83	249.03
3.	CHFPUM-3	60.00	4.50	10.17	213.33	7.57	2.00	5.70	210.20
4.	CHFPUM-4	63.50	4.50	11.90	205.00	9.80	1.82	4.66	199.10
5.	CHFPUM-5	51.63	2.77	5.93	401.00	8.37	1.60	2.83	121.07
6.	CHFPUM-6	46.80	2.43	18.17	183.33	5.07	2.00	5.20	222.20
7.	CHFPUM-7	61.00	3.67	10.23	301.67	9.23	1.70	4.23	180.87
8.	CHFPUM-8	48.10	2.90	8.67	186.67	4.77	1.65	3.40	145.23
9.	CHFPUM-9	52.43	3.87	7.63	290.00	5.83	2.15	5.83	249.23
10.	CHFPUM-10	67.93	3.77	11.27	263.33	14.57	2.37	6.27	267.77
11.	CHFPUM-11	58.81	2.80	11.53	226.67	6.97	2.70	6.03	257.80
12.	CHFPUM-12	58.30	5.17	10.60	198.33	6.03	2.87	3.03	129.60
13.	CHFPUM-13	63.30	2.83	11.57	229.33	10.30	2.07	5.17	220.73
14.	CHFPUM-14	63.13	4.30	13.27	314.00	11.23	2.90	4.83	206.50
15.	CHFPUM-15	59.30	3.23	10.53	236.67	10.37	2.75	6.43	274.67
16.	CHFPUM-16	33.93	2.60	18.17	209.33	8.97	1.70	7.37	314.77
17.	CHFPUM-17	61.93	4.77	8.07	206.00	12.03	1.77	4.63	197.97
18.	CHFPUM-18	56.10	3.23	9.50	296.67	6.47	2.47	5.97	254.97
19.	CHFPUM-19	61.30	2.83	10.50	218.33	6.23	2.90	7.07	301.93
20.	CHFPUM-20	40.30	2.33	23.57	206.67	11.50	1.67	3.60	153.80
21.	CHFPUM-21	64.13	2.93	10.50	188.67	7.93	2.50	3.80	162.33
22.	CHFPUM-22	61.30	3.33	9.77	189.67	9.90	2.40	6.00	256.17
23.	CHFPUM-23	73.80	3.50	10.77	134.33	14.37	3.00	5.77	246.17
24.	CHFPUM-24	58.50	3.63	14.73	204.33	7.10	2.63	3.90	166.60
25.	CHFPUM-25	59.43	3.17	10.83	296.67	11.03	2.20	5.73	244.97
	Mean	56.57	3.40	11.76	237.12	8.94	2.18	5.13	219.16
	CV%	3.23	9.69	4.48	10.01	6.42	12.98	5.92	5.93
	SE_{+m}	1.05	0.19	0.30	13.71	0.33	0.16	0.17	7.50
	LSD (5%)	3.00	0.54	0.86	39.00	0.94	0.46	0.49	28.48
	Minimum	33.93	2.33	5.93	134.33	4.76	1.36	2.83	121.06
	Maximum	73.80	5.16	23.56	401.00	14.56	3.00	7.36	314.76

Fig.1 Graph showing TSS in different pumpkin genotypes (LSD at 5% 1.21)

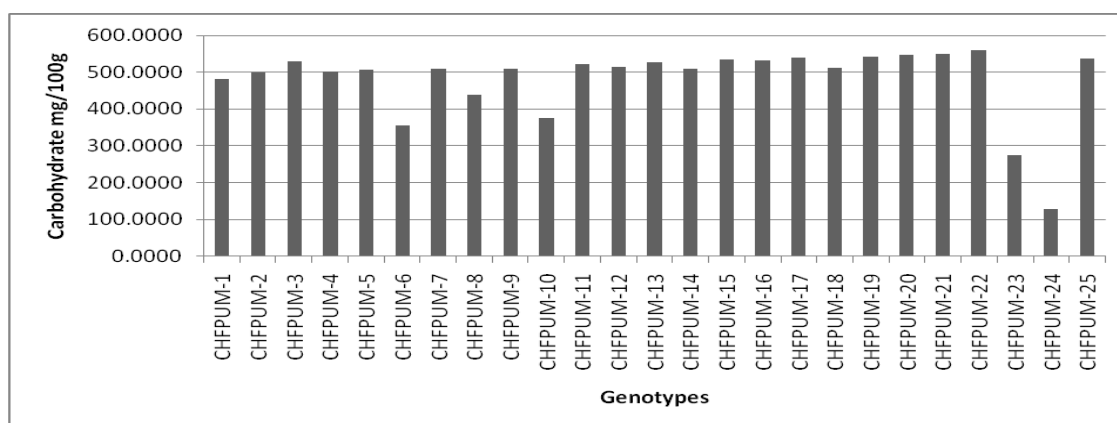


Fig.2 Carbohydrate content (mg/100g) of different genotypes of Pumpkin (LSD at 5% 22.46)

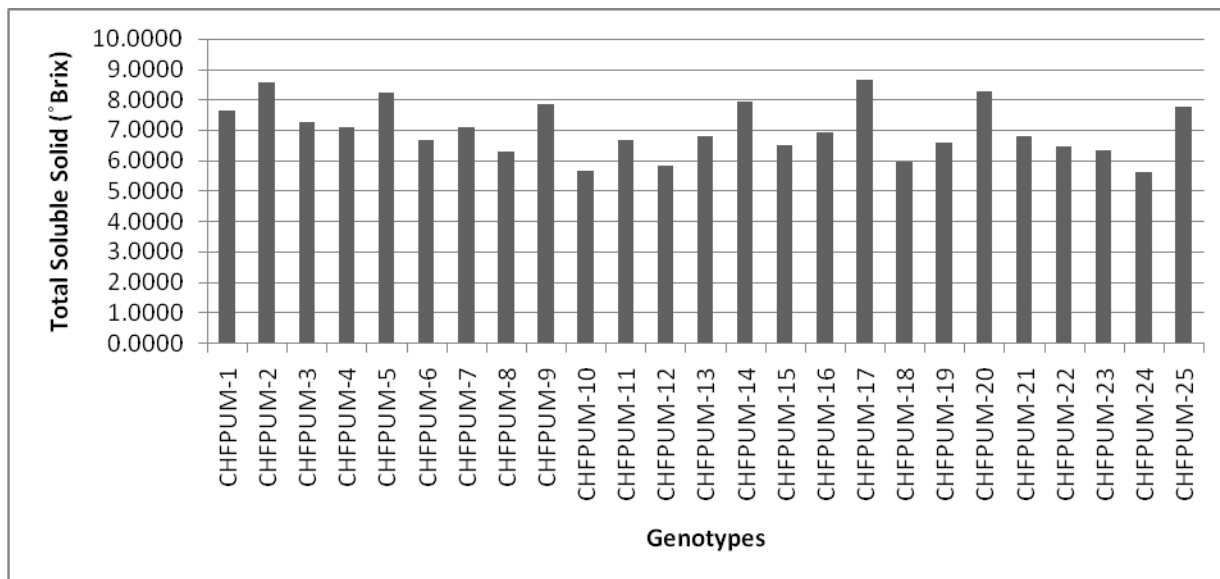
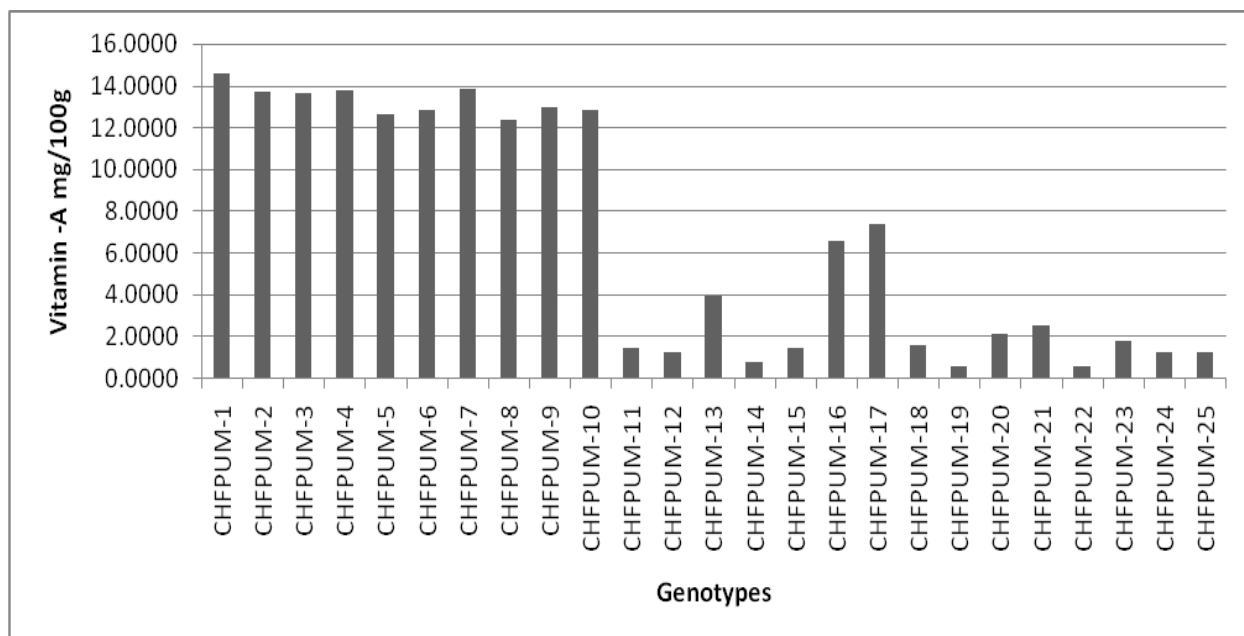


Fig.3 Graph showing vitamin-A content in different genotypes of pumpkin (LSD at 5% 0.3)



Minimum cavity length was noted in CHPUM-5 (5.93) followed by CHPUM-9 (7.63) and CHPUM-2 (7.76) (Table 3). Highest number of fruits per plant was observed in genotype CHPUM-2 (3.73) followed by CHPUM-16 and CHPUM-19 (Table 3). The result was in conformity with Tamilselvi and Jansirani (2017). The average

fruit weight of pumpkin genotype was highest recorded in genotypes CHPUM-23 (3.00 kg) followed by CHPUM-14 and CHPUM-19 (Table 3). Same result was observed by Ahmed *et al.*, (2011) and Venkatesan *et al.*, (2016). Maximum fruit yield per plant was also found in genotype CHPUM-16 (7.36 kg) followed by CHPUM-19 and CHPUM-

15 (Table 3) and this result was in conformity with Venkatesan *et al.*, (2016).

The rainfall in the region is very high due to which pollen is washed and there is less pollinator activity resulting in low yield per plant. Maximum fruit yield per hectare was recorded in CHF PUM-16 (314.76) which was found statistically at par with CHF PUM-19 (Table 3).

Quality characters

Highest total soluble solids content was observed in CHF PUM-17 (8.66) followed by CHF PUM-2 and CHF PUM-5 (Fig. 1). The result was in conformity with Kumar *et al.*, (2017), they reported a TSS range of 4.53-7.63 °Brix in pumpkin. Maximum carbohydrate content was estimated in CHF PUM-22 (559.50 mg/100 g) it was found statically at par with CHF PUM-21, CHF PUM-20 and CHF PUM-19 (Fig. 2).

Similarly Sharma *et al.*, (2013) reported a total sugar content of 106.58 mg/100 g in pumpkin.

Maximum vitamin-A content was estimated in CHF PUM-1 (14.57) followed by CHF PUM-7 and CHF PUM-4 (Fig. 3). A carotenoid content of 3.16 mg/100 g (Sharma *et al.*, 2013), 2.34-14.85 mg/100 g (Pandey *et al.*, 2003) and 3.46-8.05mg/ 100 g (Kumar *et al.*, 2017) was reported in pumpkin.

Hence conclusion, on the basis of mean performance, the genotype CHF PUM-24 (Landrace from Tripura) was found good for earliness and growth. The genotype CHF PUM-16 (landrace from Imphal, Manipur) was found to be superior for the yield attributing characters while CHF PUM-1 (landrace from Pasighat, Arunachal Pradesh) was found good for fruit quality. So, these genotypes can be used as parental source in future breeding programme.

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