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Syed Mazahir Hussain
Division of Vegetable Science, Sher-e-Kashmir University of Agricultural Sciences & Technology of Kashmir, Shalimar, Srinagar, Jammu and Kashmir, India

Khursheed Hussain
Division of Vegetable Science, Sher-e-Kashmir University of Agricultural Sciences & Technology of Kashmir, Shalimar, Srinagar, Jammu and Kashmir, India

Sumati Narayan
Division of Vegetable Science, Sher-e-Kashmir University of Agricultural Sciences & Technology of Kashmir, Shalimar, Srinagar, Jammu and Kashmir, India

Ajaz Ahmad Malik
Division of Vegetable Science, Sher-e-Kashmir University of Agricultural Sciences & Technology of Kashmir, Shalimar, Srinagar, Jammu and Kashmir, India

Khurshid Ahmad Bhat
Division of Plant Pathology, Sher-e-Kashmir University of Agricultural Sciences & Technology of Kashmir, Shalimar, Srinagar, Jammu and Kashmir, India

Khalid Z Masoodi
Division of Plant Biotechnology, Sher-e-Kashmir University of Agricultural Sciences & Technology of Kashmir, Shalimar, Srinagar, Jammu and Kashmir, India

Zahoor Ahmad Dar
DARS Budgam, Sher-e-Kashmir University of Agricultural Sciences & Technology of Kashmir, Srinagar, Jammu and Kashmir, India

Imran Khan
Division of Agri-statistics, Sher-e-Kashmir University of Agricultural Sciences & Technology of Kashmir, Shalimar, Srinagar, Jammu and Kashmir, India

Syeda Farwah
Division of Vegetable Science, Sher-e-Kashmir University of Agricultural Sciences & Technology of Kashmir, Shalimar, Srinagar, Jammu and Kashmir, India

Majid Rashid
Division of Vegetable Science, Sher-e-Kashmir University of Agricultural Sciences & Technology of Kashmir, Shalimar, Srinagar, Jammu and Kashmir, India

Harish Kumar
Division of Vegetable Science, Sher-e-Kashmir University of Agricultural Sciences & Technology of Kashmir, Shalimar, Srinagar, Jammu and Kashmir, India

Corresponding Author:
Syed Mazahir Hussain
Division of Vegetable Science, Sher-e-Kashmir University of Agricultural Sciences & Technology of Kashmir, Shalimar, Srinagar, Jammu and Kashmir, India

Comparative performance of Chilli (*Capsicum annum* L.) genotypes for qualitative traits under temperate condition of Kashmir

Syed Mazahir Hussain, Khursheed Hussain, Sumati Narayan, Ajaz Ahmad Malik, Khurshid Ahmad Bhat, Khalid Z Masoodi, Zahoor Ahmad Dar, Imran Khan, Syeda Farwah, Majid Rashid and Harish Kumar

Abstract
The present investigation was carried out at at Vegetable Experimental Field, Division of Vegetable Science, SKUAST-Kashmir Shalimar during *kharif* 2019-2021. During the study the comparative performance of seventy-eight chilli genotypes (parents and crosses) for various quality traits was evaluated and significant variation was found among the genotypes for the traits studied.

Keywords: Chilli, genotypes, hybrid, mean, quality, superior

Introduction
Chilli (*Capsicum annuum* L.) (2n=2x=24), a member of family Solanaceae and genus Capsicum comprising of more than 30 species among which only five *viz*., C. *annuum* L., C. *chinense* Jacq., C. *frutescens* L., C. *baccatum* L. and C. *pubescens* are domesticated and cultivated (Bosland and Votava, 2012) [2]. It is an important vegetable cum spice crop grown throught tropical and subtropical regions of the world. It originated from Tropical America and the West Indies, and the Portuguese brought it to India in the seventeenth century. Since then, it has become a common condiment and vegetable all throughout the world, including India. Its production and use have steadily expanded over the twentieth century, owing to its value as both a vegetable and a spice, and it is now a major component of a wide range of cuisines around the world.

The word capsicum comes from the Greek word 'kapto,' which means "to bite" or "to swallow". It is cultivated for its two important commercial attributes *viz.*, pungency and red colour. Some cultivars are known for their red colour because of the pigment capsanthin, ($C_{40} H_{56}O_3$) others are popular for biting pungency attributed to crystalline acrid volatile alkaloid capsaicin ($C_{18} H_{27}NO_3$). From nutritional point of view, the green fruit of chilli besides vitamin A, E, C and P (Singh, 1989) [11], is also rich in minerals like potassium, magnesium, calcium and iron (Serra *et al*., 2002) [12]. Evaluation of genotypes (parents versus crosses) by estimation of mean performance *per se* especially for qualitative traits gives an idea about their suitability to a region to find out the best genotypes that can be recommended after further evaluation for the region.

Materials and Methods
The experimental material for present study consists of twelve diverse genotypes of chilli (*Capsicum annuum* L.) maintained by Division of Vegetable Science, SKUAST-Kashmir, Shalimar. 66 F_1 crosses were generated through 12 x 12 diallel mating design (excluding reciprocals) at Vegetable Experimental Field, Division of Vegetable Science, SKUAST-Kashmir shalimar during *kharif* 2019. The set of 78 *viz.*, crosses (66) along with their parents (12) were evaluated in augumented block design at Experimental Farm, Division of Vegetable Science, SKUAST-Kashmir, Shalimar, during *kharif* 2020 and *kharif* 2021. The row to row and plant to plant spacing was maintained at 60 x 45 cm. Recommended package of practices will be adopted to raise a healthy crop. The observations were recorded for dry matter content (%), vitamin C content (mg $100g^{-1}$), Capsaicin content (mg g^{-1}), Capsanthin (ASTA) Units and Total phenols (mg100 g^{-1}).

Results and Discussion

The mean performance of twelve parents and sixty-six crosses of chilli for various quality attributing traits is given in Table 1 which clearly indicated that genotypes differed significantly for all the traits under study. The estimates of mean values from Table 1 revealed that no genotype was superior for all the characters under study. However cross SKAU-SC-1155 x SKAU-SHC-132 recorded the maximum dry matter content of 88.99% followed by SKAU-SC-132 x SKAU-SC-109 (88.11%) and SKAU-SHC-148 x SKAU-SHC-191 (87.36%). Cross SKAU-SHC-191 x SKAU-SC-01 recorded the highest vitamin C content of 311.48 mg $100g^{-1}$ followed by SKAU-SHC-191 x SKAU-SHC-128 (300.40 mg $100g^{-1}$) and SKAU-SHC-191 x SKAU-SC-2 (288.83 mg $100g^{-1}$). The cross SKAU-SHC-148 x SKAU-SC-01 recorded the highest capsaicin content of 0.74 mg g^{-1} followed by SKAU-SC-132 x SKAU-SC-109 (0.73 mg g^{-1}) and SKAU-SC-2 x SKAU-SC-109 (0.72 mg g^{-1}). The cross SKAU-SHC-148 x SKAU-SC-01 recorded the highest capsanthin content of 139.68 followed by SKAU-SC-1155 x Local Selection (134.33) and SKAU-SC-132 x SKAU-SC-109 (132.54). The cross SKAU-SHC-148 x SKAU-SC-01 recorded the highest phenol content of 11.27 mg g^{-1} followed by SKAU-SC-01 x SKAU-SC-109 (10.29 mg g^{-1}) and SKAU-SHC-148 x SKAU-SHC-211 (10.13 mg g^{-1}). A similar pattern of wide range of variations existing for various qualitative traits has also been reported in chilli by various workers like Farhad *et al.* (2008) [4], Patel *et al.*, (2009) [9], Gupta *et al.* (2009) [6], Chattopadhyay *et al*. (2011) [3], Zehra (2014) [13], Janaki *et al*. (2015) [7], Pandiyaraj (2017) [10], Jogi *et al*. (2017) [8], Ain (2018) [1] and Farwah *et al.* (2020) [5].

Table 1: Mean performance of genotypes for quality traits in Chilli (*Capsicum annum* L.) (Data pooled over environments)

Genotypes	Dry matter content (%)	Vitamin C content (mg100g^{-1})	Capsaicin content (mg g^{-1})	Capsanthin (ASTA) Units	Total phenol (mg100 g^{-1})
KL-1 x SKAU-SC-1155	81.45	62.44	0.45	117.87	4.54
KL-1 x SKAU-SHC-132	77.78	74.91	0.43	84.41	7.81
KL-1 x SKAU-SHC-148	74.25	105.00	0.46	117.50	6.80
KL-1 x SKAU-SHC-211	74.10	56.51	0.42	66.08	7.47
KL-1 x SKAU-SHC-191	75.16	152.78	0.35	53.01	7.33
KL-1 x NS 1101	75.45	90.55	0.44	63.96	4.57
KL-1 x Local Selection	80.66	153.46	0.46	64.32	7.59
KL-1 x SKAU-SC-01	81.17	101.10	0.51	70.50	5.11
KL-1 x SKAU-SHC-128	73.37	203.15	0.55	86.18	9.38
KL-1 x SKAU-SC-2	75.93	124.06	0.53	65.93	4.91
KL-1 x SKAU-SC-109	65.40	62.05	0.61	93.40	4.58
SKAU-SC-1155 x SKAU-SHC-132	88.99	153.75	0.42	100.85	7.53
SKAU-SC-1155 x SKAU-SHC-148	77.52	192.91	0.61	100.97	8.82
SKAU-SC-1155 x SKAU-SHC-211	80.57	133.63	0.45	93.42	7.33
SKAU-SC-1155 x SKAU-SHC-191	68.05	136.65	0.46	111.45	2.99
SKAU-SC-1155 x NS-1101	60.06	254.58	0.56	64.52	9.26
SKAU-SC-1155 x Local Selection	81.65	231.53	0.47	134.33	4.62
SKAU-SC-1155 x SKAU-SC-01	75.73	87.03	0.48	61.50	9.66
SKAU-SC-1155 x SKAU-SHC-128	70.35	97.45	0.55	84.02	7.28
SKAU-SC-1155 x SKAU-SC-2	81.30	122.96	0.54	70.34	7.33
SKAU-SC-1155 x SKAU-SC-109	72.27	132.93	0.64	77.48	6.83
SKAU-SC-132 x SKAU-SHC-148	76.67	120.48	0.52	83.03	8.51
SKAU-SC-132 x SKAU-SHC-211	82.23	126.45	0.60	103.38	9.34
SKAU-SC-132 x SKAU-SHC-191	87.07	219.41	0.48	77.89	7.54
SKAU-SC-132 x NS-1101	70.00	169.41	0.67	100.58	7.61
SKAU-SC-132 x Local selection	71.48	75.71	0.44	109.69	8.61
SKAU-SC-132 x SKAU-SC-01	81.77	256.96	0.56	111.56	9.64
SKAU-SC-132 x SKAU-SHC-128	79.84	151.95	0.52	61.00	10.06
SKAU-SC-132 x SKAU-SC-2	83.07	67.26	0.66	70.35	9.65
SKAU-SC-132 x SKAU-SC-109	88.11	126.93	0.73	132.54	7.50
SKAU-SHC-148 x SKAU-SHC-211	72.66	75.26	0.61	95.40	10.13
SKAU-SHC-148 x SKAU-SHC-191	87.36	224.38	0.46	110.78	9.27
SKAU-SHC-148 x NS-1101	70.55	136.81	0.53	113.81	8.26
SKAU-SHC-148 x Local Selection	84.89	51.40	0.70	85.24	9.32
SKAU-SHC-148 x SKAU-SC-01	72.60	149.83	0.74	139.68	11.27
SKAU-SHC-148 x SKAU-SHC-128	80.17	92.98	0.51	79.46	8.33
SKAU-SHC-148 x SKAU-SC-2	77.62	99.91	0.61	66.92	4.60
SKAU-SHC-148 x SKAU-SC-109	83.00	136.83	0.57	100.36	8.61
SKAU-SHC-211 x SKAU-SHC-191	66.56	77.73	0.64	100.42	9.78
SKAU-SHC-211 x NS-1101	75.53	106.83	0.64	82.28	7.10
SKAU-SHC-211 x Local Selection	72.44	124.41	0.48	84.44	7.47
SKAU-SHC-211 x SKAU-SC-01	77.88	87.41	0.51	62.48	8.70
SKAU-SHC-211 x SKAU-SHC-128	71.67	135.48	0.54	61.04	7.05
SKAU-SHC-211 x SKAU-SC-2	76.82	136.31	0.55	63.44	7.12
SKAU-SHC-211 x SKAU-SC-109	77.39	57.43	0.69	65.36	7.55

SKAU-SHC-191 x NS-1101	80.42	284.10	0.38	82.45	6.17
SKAU-SHC-191 x Local Selection	82.47	274.55	0.39	80.48	9.64
SKAU-SHC-191 x SKAU-SC-01	79.10	288.83	0.45	84.13	7.11
SKAU-SHC-191 x SKAU-SHC-128	78.64	300.40	0.42	70.86	4.29
SKAU-SHC-191 x SKAU-SC-2	83.45	311.48	0.38	83.81	9.33
SKAU-SHC-191 x SKAU-SC-109	80.47	255.43	0.49	70.97	8.58
NS-1101 x Local Selection	79.70	59.31	0.64	97.05	7.04
NS-1101 x SKAU-SC-01	82.54	41.88	0.56	87.04	4.78
NS-1101 x SKAU-SHC-128	79.50	168.90	0.57	96.88	4.58
NS-1101 x SKAU-SC-2	79.44	109.35	0.53	97.84	9.54
NS-1101 x SKAU-SC-109	75.58	93.71	0.62	75.91	4.81
Local Selection x SKAU-SC-01	79.18	235.50	0.53	100.27	9.54
Local Selection x SKAU-SHC-128	75.78	67.88	0.61	65.60	7.53
Local Selection x SKAU-SC-2	77.38	140.93	0.55	68.34	7.90
Local Selection x SKAU-SC-109	77.42	100.43	0.70	100.42	5.72
SKAU-SC-01 x SKAU-SHC-128	82.38	158.16	0.54	84.23	9.00
SKAU-SC-01 x SKAU-SC-2	82.78	152.55	0.55	105.37	8.87
SKAU-SC-01 x SKAU-SC-109	75.22	154.40	0.70	79.28	10.29
SKAU-SHC-128 x SKAU-SC-2	80.04	57.41	0.66	66.42	6.34
SKAU-SHC-128 x SKAU-SC-109	78.28	120.53	0.70	79.23	6.27
SKAU-SC-2 x SKAU-SC-109	79.30	41.50	0.72	65.16	9.41
KL-1	79.23	126.33	0.36	73.18	4.60
SKAU-SC-1155	84.07	70.43	0.37	91.46	5.34
SKAU-SHC-132	75.71	82.60	0.45	104.15	6.35
SKAU-SHC-148	79.97	101.93	0.41	100.36	5.11
SKAU-SHC-211	80.91	69.93	0.44	102.95	5.55
SKAU-SHC-191	75.49	129.28	0.40	86.80	4.36
NS-1101	74.41	91.90	0.34	105.11	3.41
Local Selection	71.88	132.55	0.40	67.36	3.82
SKAU-SC-01	79.80	92.40	0.34	122.40	5.89
SKAU-SHC-128	80.23	102.00	0.36	69.52	4.58
SKAU-SC-2	79.51	87.30	0.31	69.61	3.71
SKAU-SC-109	71.90	91.80	0.42	88.97	3.83
Mean	77.69	132.47	0.52	86.38	7.17
C.V %	0.58	0.03	1.20	2.12	0.27
S.Em ±	0.26	0.028	0.003	1.05	0.01
C.D at 5%	0.26	0.07	0.01	2.95	0.03

Conclusion

In this study the genotypes showed wide range of performance for most of the quality traits (Table-1). Based on the overall performance of the genotypes under study the cross SKAU-SHC-148 x SKAU-SC-01 was found to be the best as far as quality traits are concerned.

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