Characterization of Bioactive Compounds and Antioxidant Activity in Different Genotypes of Chilli (Capsicum annum L.) Under North-Western Himalayas Region of Jammu and Kashmir, India

Comment [O.I.1]: (*Capsicum annum* L.)

ABSTRACT

This current study was designed to evaluate the antioxidant capacity and total phenolic contents from forty-five genotypes of chilli collected from different states of India representing different agro-ecological regions. The antioxidant property was assayed by scavenging abilities using diphenyl-2-picrylhydrazyl (DPPH), azinobisethylbenzothiazoline-6-sulphonic acid (ABTS), assay of ferric reducing antioxidant power (FRAP), and determining total phenolics (TP) and total flavonoids (TF) contents. There was a significant variation in the total phenolic content (17.38–131.5mg GAE/g dry weight), total flavonoid (14.07–56.15 mg quercetin/g dry weight), DPPH (0.55–5.60 mM AAE/g dry weight), ABTS (16.03– 38.12 mM AAE/g dry weight) and FRAP (0.80– 6.40 mM GAE/dry weight). Three genotypes viz. IC-561635, CITH-HP-22 and IC-561731 exhibited highest values for all the antioxidant assays. Positively significant correlation coefficients were observed between ABTS–FRAP, TF– FRAP, TP–FRAP, TP–DPPH and TP–TF. Forty-five genotypes of chilli were grouped into seven clusters based on the standardized squared Euclidean distance using Ward's hierarchical clustering method. The experiment established that the genotypes of chilli are potent source of natural antioxidants which reduce the oxidation processes in the body by protecting against reactive oxygen species.

Keywords: **Chilli, genotypes, antioxidant**

INTRODUCTION:

The Novel Coronavirus disease-2019 (COVID-19 has inflicted mayhem worldwide, claiming more than 5.5 million lives and infecting more than 323 million people [1]. The vaccine is now available against COVID-19 but still the importance of natural compounds of inhibition and remedy cannot be ignored. In this aspect, the food and dietary habit play key perspectives in deciding general wellbeing and resistance [2].

Comment [O.I.2]: (COVID-19)

Vegetables are good option to build resilience in the body against infection. Vegetables are importance because being low in calories are packed with vitamins, minerals, antioxidants and photochemical. Therefore, the use of natural compounds may provide alternative prophylactic and therapeutic support along with the therapy for COVID-19.

Comment [O.I.3]: important

Comment [O.I.4]: phytochemicals.

Chilli (*Capsicum annuum* L.) is highly valued as an excellent source of natural pigments and antioxidant compounds. Chilli has varied uses in diverse situations, it is used as spice, condiment, traditional medicine, vegetable or ornamental plant. Chilli is an indispensable spice in Indian cuisines owing to its pungency, colour and aroma. Nutritionally, it is a rich source of vitamins A, C, E, thiamine, molybdenum, manganese, potassium, carotenoids, and phenolic compounds [3], These compounds provide many nutritional and health benefits that include antioxidant, anti-inflammatory, and antimicrobial activities, reduced prevalence of type 2 diabetes and obesity, protection against hypercholesterolemia, and reduced prevalence of atherosclerotic cardiovascular diseases [4,5]

However, the composition and levels of specific phytochemicals with antioxidant potential present in vegetables do not essentially imitate the total antioxidant capacity, which depends on the type and concentration of phytochemicals, as well as the coactive or inhibitory interaction of molecules in the matrix. Therefore, it is imperative to study the phytochemicals present in vegetables of high importance like chilli, in order to generate information about their possible health benefits. These nutrients can be repurposed in mitigating the pathological effects induced by the SARS-CoV-2 infection. The objective of this study was to ~~carried out to~~ investigate the antioxidant properties (total phenolic content, total flavonoid content) in forty-five Chilli (*Capsicum annuum* L.) cultivars grown in Kashmir.

Comment [O.I.5]: Delete

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Material and method

Comment [O.I.8]: Materials and method

Planting material/ samples:

The experimental material comprised of forty-five genotypes of chilli collected from different states of India representing different agro-ecological regions were evaluated for various quantitative and quality traits at the Experimental Field, Division of Vegetable Science, SKUAST-Kashmir, Shalimar Srinagar, during Kharif 2021. Details of genotypes along with their source are presented in the Table-1. Seeds were removed from red ripe stage fruits of uniform physiological maturity and pericarp along with placenta were left to dry, in

Comment [O.I.9]: materials

air oven (40 ^{0}C) for 15 days and then powdered with pestle and mortar and passed through a 100- mesh sieves and extraction was carried out with methanolic extract, the material (5 g of fruits) was extracted with 70 % ethanol (plant: solvent, 1:10, w/v) under mechanical orbital shaker at room temperature for 72 h. Extracts were filtered using a Buckner funnel and Whatman No. 1 filter paper and ethanol was allowed to dry. Each extract was suspended in methanol to make 50 mg/ml stock solution.

Table 1: List of chilli (*Capsicum annuum* L.) genotypes used in the present study

S.No.	Chilli Genotypes	Source	S.No.	Chilli Genotypes	Source
1.	LSVT-Red -1	Gujarat	27.	IC-561627	NBPGR
2.	LSVT-Red-2	Gujarat	28.	SK-SC-1162	CITH-Srinagar
3.	LSVT-Red-3	Gujarat	29.	SKAU-078	SKUAST-K
4.	Kashmiri Long-1	SKUAST-K	30.	V0BC-0289	Orrisa
5.	IC-561652	NBPGR	31.	Jawahar Mirch	Jabalpur Madhya Pradesh
6.	IC-561614	NBPGR	32.	Guccha Mirch-1	Chamba-Himachal Pradesh
7.	IC-561610	NBPGR	33.	SK-SC-1161	CITH-Srinagar
8.	IC-561730	NBPGR	34.	Guccha Mirch-2	Chamba -Himachal-Pradesh
9.	IC-561665	NBPGR	35.	CITH-HP-17/13	CITH-Srinagar
10.	IC-572487	NBPGR	36.	ARCH-228	IIVR
11.	IC-561618	NBPGR	37.	SKAU-084	SKUAST K
12.	IC-561661	NBPGR	38.	G-4	Andhra Pradesh (ANGRAU)
13.	IC-561691	NBPGR	39.	CITH-HP-171/13	CITH-Srinagar
14.	Kashi Anmol	Varanasi (IIVR)	40.	CITH-HP-22	CITH-Srinagar
15.	IC-561657	NBPGR	41.	Sel-680/11	CITH-Srinagar
16.	CITH-HP-16	CITH-Srinagar	42.	CITH-HP-71/13	CITH-Srinagar
17.	IC-561731	NBPGR	43.	SKAU-089	SKUAST-K
18.	IC-561622	NBPGR	44.	CITH-HP-1154-1/13	CITH-Srinagar
19.	Sel-839-2	CITH-Srinagar	45.	SKAU-092	SKUAST-K
20.	CITH-HP-111	CITH-	46.	SKAU-096	SKUAST-K

		Srinagar			
21.	Sel-917-111	CITH-Srinagar	47.	Goa-Sel-1	Goa
22.	CITH-HP-1154	CITH-Srinagar	48.	SKASU-111	SKUAST-K
23.	IC-561631	NBPGR			
24.	IC-561635	NBPGR			
25.	IC-561639	NBPGR			
26.	Pusa Sadabahar	New Delhi (IARI)			

Determination of Total Polyphenolic Content (TPC)

Total phenolic content of different extracts was assessed with Folin–Ciocalteu method [6]. Phenolic concentration of extracts was estimated from a gallic acid calibration curve. To make a calibration curve, 0.5 ml aliquots of 12.5, 25, 50, 100, 200, and 400 lg/ml methanolic gallic acid solutions were mixed with 2.5 ml Folin–Ciocalteu reagent (diluted tenfold) and 2.5 ml (75 g/l) sodium carbonate. After incubation at 25^0C for 30 min, the quantitative phenolic estimation was performed at 765 nm against reagent blank by spectrophotometer. A similar procedure was adopted for the extracts as described above in the preparation of calibration curve. All determinations were performed in triplicate. Total phenolic content was expressed as milligrams of gallic acid equivalent (GAE)/g dry weight.

Total Flavonoid

Total flavonoid was estimated using the method of [7]. Sample of 0.5 ml was mixed with equal volume of 2 % AlCl3 ethanol solution which was kept for 1 h at room temperature, then the absorbance was measured at 420 nm. Total flavonoid content was calculated as mg quercetin/g dry weight based on calibration curve.

Comment [O.I.10]: AlCl $AlCl_3$

Antioxidant activity determination by 2,2-diphenyl-1-picrylhydrazyl (DPPH) Assay

The DPPH scavenging assay is based on electron donation of antioxidants to neutralize DPPH radical. The reaction is accompanied with colour change of the DPPH measured at 517 nm, and the discolouration acts as an indicator of the antioxidant efficacy. The method is largely based on the assumption that antioxidant activity is equal to its electron donating capacity or so-called reducing power. For measuring DPPH radical scavenging activity 2 ml of each extract and control at various concentrations were added to 3 ml of freshly prepared DPPH solution (50 lM) in methanol [8]. The reaction was allowed for 30 min and

absorbance was measured at 517 nm using a spectrophotometer. Results were expressed in mM of ascorbic acid equivalent (AAE)/g dry weight.

Azino-Bis(3-Ethylbenzothiazoline-6-Sulfonic Acid (ABTS) Radical Scavenging Activity ABTS Assay

For ABTS assay, stock solutions included 7.4 mM ABTS solution and 2.6 mM potassium persulfate solution [9]. The working solution was then prepared by mixing the two stock solutions in equal quantity and allowing them to react for 12 h at room temperature in the dark. The solution was then diluted by mixing 1 ml ABTS solution with 60 ml methanol to obtain an absorbance of 1.1 ± 0.02 units at 734 nm using the spectrophotometer. Sample extracts (150 ml) were allowed to react with 2850 ml of the ABTS solution for 2 h in a dark condition. Then the absorbance was taken at 734 nm using the spectrophotometer. Results were expressed in mM of ascorbic acid equivalent (AAE)/g dry weight.

Ferric reducing antioxidant power (FRAP) determination Assay

The FRAP test is an ET-based approach that evaluates the reduction of ferric ion ($Fe3^{+}$)–ligand complex to the brightly blue ferrous ($Fe2^{+}$) complex in acidic conditions by antioxidants. FRAP assay was conducted using method of [10] with some modifications. 200 ml of extract were added with 3 ml of FRAP reagent that was prepared with mixture of 300 mM sodium acetate buffer at pH 3.6, 10 mM 2,4,6- tri (2-pyridyl)-s-triazine (TPTZ) solution and 20 mM $FeCl_3 6H2O$ at the ratio of 10:1:1. The reaction mixture was incubated in a water bath at 37C for 30 min. The increase in absorbance was measured using spectrophotometer at 593 nm. The antioxidant capacity based on the ability to reduce ferric ions of the extracts was calculated as mM GAE/g dry weight from the GAE–FRAP standard curve

Comment [O.I.11]: (Fe^{3+})

Comment [O.I.12]: (Fe^{2+})

Comment [O.I.13]: $FeCl_3 6H_2O$

Comment [O.I.14]: 37°C

Statistical Analysis

Data were submitted to analysis of variance (ANOVA) and significant differences in mean values were separated using Tukey's test at $\alpha = 0.05$. Statistical analyses were performed using R software [11].

Results and Discussion

Total Phenolic Content and Total Flavonoids

Genotypes collected from different states of India representing different ecological zones revealed significant differences for total phenolic content (Table 2). The amount of total phenolic contents varied from 17.38 (IC-561652) to 131.5 (IC-561635) mg GAE/g dry

weight. Total flavonoid content also varied significantly among the population. The maximum flavonoid content was exhibited by IC-561731 (56.15 mg quercetin/g dry weight) however, the minimum was observed in IC-561652 (14.07 mg quercetin/g dry weight). Phenolic compounds and flavonoids contribute largely for the antioxidant properties due to presence of bioactive compounds [12]. The phenolic compounds tend to inhibit lipid autoxidation by acting as radical scavengers. Phenols are compounds that have the ability to destroy radicals because they contain hydroxyl groups. These important plant components give up hydrogen atoms from their hydroxyl groups to radicals and form stable phenoxyl radicals and, consequently, are essential antioxidants that protect against the propagation of oxidative stress. Research studies indicate that hotter varieties of Capsicum contain more phenolic compounds as compared to the sweeter ones [13]. Flavonoid are also involved for their antioxidant activities because of the ability of hydrogen donation to stabilize the phenoxyl radicals formed [14] and thus play an important role as antioxidant agent and scavenge the free radical reaction. Existence of high phenol and flavonoid content in the Chilli genotypes point to their potentiality in Nutra pharmaceutical uses. The diversity in total phenolic content and total flavonoid among the genotypes could be attributed to diversity of habitat [15]

Antioxidant Activities:

Antioxidant activity varied significantly among the population which was measured through DPPH , ABTS and FRAP assay (Table 2). The diversity in antioxidant activities among the genotypes can be to their diverse chemical compositions exist in each extract. Thus, the antioxidant potential cannot be prophesied only on its total phenolic content. The amount of DPPH antioxidant activity varied from 0.55 mM AAE/g dry weight (IC-561652) to 5.60 mM AAE/g dry weight (IC-561635). IC-561731, CITH-HP-22 and CITH-HP-111 genotypes also recorded maximum DPPH antioxidant activity. ABTS antioxidant activity ranged between 16.03 (IC-561652) and 38.12 (IC-561635) mM AAE/g dry weight. IC-561731, LSVT Red-1 and IC-561703 also recorded high ABTS antioxidant activity. Antioxidant activity measured by FRAP assay varied from 0.80 (IC-561652) to 6.40 (IC-561731) mM GAE/dry weight. IC-561635, IC-561730 AND LSVT Red-1 are the genotypes showing maximum FRAP antioxidant activity. The results of the antioxidant capacity valuation of the chilli genotypes by FRAP, ABTS, and DPPH assays are shown in Table 2. These variances may perhaps be described by diverse analytical methods. FRAP assay measures the ability to reduce a ferric tripyridyltriazine ($Fe3^{+}$-TPTZ) to a ferrous form ($Fe2^{+}$-TPTZ) of samples [16]. ABTS and DPPH assays are based on the reduction of ABTS and DPPH free radicals[17] of samples. The results are in agreement with the results [18] also found variation in the results of antioxidant capacity by the DPPH assay (2.28 to 15.6 µmol TEAC g-1) and by the FRAP assay (3.99 to 84.67 µmol TEAC g-1) in chili pepper.

Comment [O.I.15]: Fe^{3+}

Comment [O.I.16]: Fe^{2+}

Comment [O.I.17]: were

Table-2: Mean performance of different genotypes of chilli (*Capsicum annuum* L.)

S.No	Genotypes	Total Phenolic Content(mg GAE/g dry weight)	Total flavonoid mg quercetin/g dry weight	DPPH mM AAE/g dry weight	ABTS mM AAE/g dry weight.	FRAP mM GAE/dry weight
1	IC-561635	131.5	54.06	5.60	38.12	4.4
2	CITH-HP-22	130.00	53.00	5.30	31.25	3.50
3	IC-561731	129.20	56.15	5.50	38.00	6.40
4	IC-561730	127.30	54.14	5.20	36.10	4.20
5	IC-572487	125.53	51.07	4.80	34.08	4.00
6	LSVT-Red-1	120.43	50.05	4.50	32.22	4.10
7	LSVT-Red-2	119.13	49.05	4.20	36.11	3.90
8	SK-SC-1161	118.03	48.13	4.10	35.30	3.70
9	LSVT-Red-3	118.06	47.00	4.00	34.10	3.60
10	IC-561610	114.16	45.10	3.90	33.15	3.10
11	CITH-HP-16	112.20	43.03	3.50	32.16	3.00
12	IC-561665	110.20	42.18	3.40	30.15	3.90
13	Bhut Jolokia	108.06	40.16	3.30	29.08	3.75
14	Kashmiri Long -1	107.05	40.07	3.40	29.00	3.90
15	Sel-917-111	106.37	39.05	3.90	30.11	3.60
16	IC-561639	103.21	41.00	4.10	31.22	3.00
17	IC-561661	102.26	36.16	3.30	31.13	3.40
18	IC-561622	100.48	29.09	4.10	20.33	2.50
19	SKAU-078	97.36	28.10	4.50	31.12	3.10

20	SKAU-084	95.16	27.22	4.30	30.00	2.90
21	CITH-HP-71/13	94.20	25.98	4.00	29.09	2.70
22	Sel-680/11	92.26	25.08	3.90	32.18	2.00
23	IC-561627	82.46	29.08	5.10	32.00	2.80
24	ARCH-228	78.10	27.03	3.10	33.10	2.08
25	Guccha Mirch-1	70.30	28.21	5.10	31.21	2.00
26	IC-561614	69.14	27.05	4.80	28.15	2.60
27	CITH-HP-111	58.11	28.08	5.20	24.11	2.10
28	VOBC-0289	56.20	27.14	2.50	29.10	1.50
29	Guchha Mirch-2	53.40	25.14	4.20	31.00	2.50
30	CITH-HP-171/13	51.30	24.11	4.10	23.10	2.70
31	SKAU-092	47.35	23.09	3.00	21.12	1.80
32	CITH-HP-17/13	45.13	25.00	3.20	22.07	2.80
33	SKAU-096	44.13	26.09	5.10	34.12	2.30
34	IC-561657	43.03	25.23	4.00	29.13	2.10
35	Jawahar Mirch	42.13	24.06	3.80	28.00	2.00
36	CITH-HP-1154-1/13	36.12	20.07	3.40	23.09	2.30
37	IC-561618	48.11	24.00	3.50	28.22	2.25
38	CITH-HP-1154	35.12	20.13	3.20	22.15	1.45
39	IC-561691	31.21	19.10	3.25	20.00	1.70
40	Sel-839-2	30.13	18.50	3.00	20.50	2.00
41	G-4	28.00	17.50	2.10	19.03	1.80
42	Goa-sel-1	23.83	17.00	2.50	18.50	1.50
43	SK-SC-1162	21.11	17.07	2.80	18.06	1.90

44	SKAU-089	20.08	16.03	2.00	17.19	1.10
45	IC-561652	17.38	14.07	0.55	16.03	0.80
CV (%)		0.28	0.90	2.14	0.67	0.48

Comment [O.I.18]: Please present results in Mean±SEM

Distribution of genotypes into different clusters

Based upon the performance of genotypes, forty-five genotypes were grouped into Seven clusters (Table-3, Fig 1) using R Software [11]. The cluster diagram and dendrogram indicated that the maximum number of genotypes fall in cluster III (11) followed by cluster I, II (each 8), cluster V (7), cluster IV (6), cluster VI (4) and cluster (1). Cluster I consisted, IC-561610, CITH-HP-16, IC-561665, SKAU-111, Kashmiri Long -1, Sel-917-111, IC-561639, IC-561661. Cluster II included following genotypes IC-561635, CITH-HP-22, IC-561730, IC-572487, LSVT-Red-1, LSVT-Red-2, SK-SC-1161, LSVT-Red-3. Cluster III included maximum genotypes CITH-HP-171/13, SKAU-092, CITH-HP-17/13, SKAU-096, IC-561657, Jawahar Mirch, CITH-HP-1154-1/13, IC-561618, CITH-HP-1154, VOBC-0289, Guchha Mirch-2. Cluster IV included following genotypes IC-561622, SKAU-078, SKAU-084, CITH-HP-71/13, Sel-680/11 , IC-561627. Cluster V included following genotypes IC-561691, Sel-839-2, G-4, Goa-sel-1, SK-SC-1162, SKAU-089, IC-561652. Cluster VI included following genotypes ARCH-228, Guccha Mirch-1, IC-561614, CITH-HP-111 and luster VII included one genotypes IC-561731. The formation of different clusters with variable number of entries in each cluster indicated diversity among genotypes. The genotypes from different states of India were found to be scattered in different clusters, which suggested that a pattern of clustering of accessions was independent of their geographic origin.

Comment [O.I.19]: cluster

Table-3: Distribution of chilli (*Capsicum annuum* L.) genotypes into clusters

S. No	Cluster	No. of genotypes in the cluster	Name of genotypes

1	I	8	IC-561610, CITH-HP-16, IC-561665, SKAU-111, Kashmiri Long -1, Sel-917-111, IC-561639, IC-561661
2	II	8	IC-561635, CITH-HP-22, IC-561730, IC-572487, LSVT-Red-1, LSVT-Red-2, SK-SC-1161, LSVT-Red-3
3	III	11	CITH-HP-171/13, SKAU-092, CITH-HP-17/13, SKAU-096, IC-561657, Jawahar Mirch, CITH-HP-1154-1/13 IC-561618, CITH-HP-1154, VOBC-0289, Guchha Mirch-2
4	IV	6	IC-561622, SKAU-078, SKAU-084, CITH-HP-71/13, Sel-680/11 , IC-561627
5	V	7	IC-561691, Sel-839-2, G-4, Goa-sel-1, SK-SC-1162, SKAU-089, IC-561652
6	VI	4	ARCH-228, Guccha Mirch-1, IC-561614, CITH-HP-111
7	VII	1	IC-561731

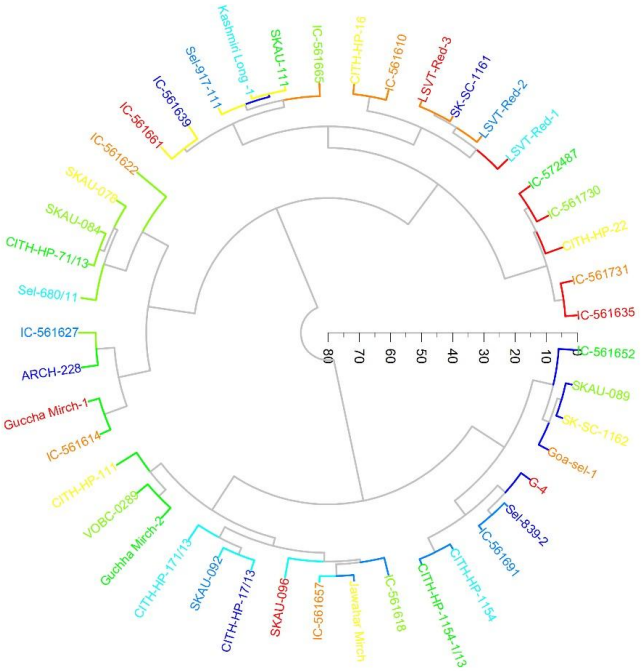

Fig 1: Dendrogram generated by hierarchical cluster analysis showing the relationships among the characterized Chilli genotypes

Identification of diverse and desirable genotypes

Non- hierarchical cluster analysis was also performed in addition to grouping of genotypes into different clusters so as to identify the diverse and desirable genotypes in terms of inter cluster distance and mean performance of clusters for various characters, respectively. For this purpose, intra and inter cluster distances (Table-4) and the mean performance of each cluster for different traits was studied..

Comment [O.I.20]: were studied.

The intra cluster distance ranged from 0.00 (cluster VII) to 12.30 (cluster VI) indicating that the genotypes in clusters have dissimilarity for traits under study . The members of cluster VI exhibited maximum divergence (intra cluster distance 12.30) followed by members of cluster III (10.09). The inter cluster distance were larger than the intra cluster distances indicating a wider genetic diversity between genotypes of cluster with respect to traits considered. Maximum inter-cluster distance indicates that genotypes falling in these clusters

had wide diversity and can be used for hybridization programme to get better recombinants in the segregating generation. Low levels of intra-cluster distances reveal narrow genetic variation with in cluster. Genotypes of some cluster may not provide desirable recombinants. The inter cluster distance D^2 values was highest between cluster VII and cluster V (88.02) followed by cluster V and cluster II (81.43).

Comment [O.I.21]: within clusters.

The importance of different plant characters in the inter-cluster divergence can be studied further by comparing cluster mean for different characters. Based on mean of the clusters, the donors for different characters could be selected from clusters. The cluster mean values for five characters are presented in Table-5. The perusal of data indicated considerable differences for all the characters among clusters. It is inferred from the cluster means that each cluster has its uniqueness that separated it from other cluster. Highest cluster mean for Total Phenolic Content (129.20) was found in Cluster VII while the lowest cluster mean for Total Phenolic Content (24.54) was found in cluster V. The highest cluster mean for Total flavonoid (56.15) was found in cluster VII and lowest cluster mean for Total flavonoid (17.04) was found in cluster V. The highest cluster mean for DPPH (5.50) was found in cluster VII while the lowest cluster mean for DPPH (2.31) in cluster V.The highest cluster mean for ABTS(38.00) was found in cluster VII and the lowest cluster mean for ABTS (18.47)Was found in cluster V. The highest cluster mean for FRAP(6.40) in cluster VII while lowest (1.54) in cluster IX. Highest cluster mean for fruit length (13.80 cm) in cluster XII while lowest (2.60 cm) in cluster V.

Table-4: Average intra cluster (Underlined) and inter cluster (above diagonal) distance values in chilli (*Capsicum-annuum* L.)

	Group. 1	Group .2	Group .3	Group .4	Group .5	Group .6	Group .7
Group. 1	7.04	17.89	48.94	16.67	66.61	31.90	24.69
Group.2		8.76	63.23	31.03	81.43	45.70	12.86
Group.3			10.09	37.97	21.17	21.18	69.68
Group.4				9.18	55.22	21.52	37.57
Group.5					9.01	38.54	88.02
Group.6						12.30	52.36
Group.7							0.00

Table-5: Cluster means for various characters in different clusters of chilli (*Capsicum annuum* L.)

	Total Phenolic Content	**Total flavonoid**	**DPPH**	**ABTS**	**FRAP**
Cluster-I	107.94	40.85	3.60	30.75	3.46
Cluster-II	123.78	50.81	4.71	34.68	3.93
Cluster-III	45.64	24.10	3.64	26.47	2.15
Cluster-IV	93.64	27.43	4.32	29.12	2.67
Cluster-V	24.54	17.04	2.31	18.47	1.54
Cluster-VI	68.91	27.60	4.55	29.15	2.25
Cluster-VII	129.20	56.15	5.50	38.00	6.40

Relationship Among Total Phenol, Flavonoid and Antioxidant Assay

Pearson correlation analysis was performed to evaluate the suitability and reliability of the antioxidant assay for the measurement of total antioxidant activity in Chilli genotypes (Fig. 2). Correlation coefficient measures the degree of association between two or more parameters. Results revealed significant positive correlation among total phenol, flavonoid and antioxidant assay and suggest reliabilities of these methods. Significant positive correlation was found among Total Phenolic Content- Total flavonoid ($r = 0.93$), DPPH–ABTS ($r = 0.71$), ABTS–FRAP ($r = 0.73$) and FRAP- Total flavonoid ($r = 0.89$). Strong positive relationship of antioxidant assays suggested that all antioxidant assays used in this study are comparable and exhibit their suitability for chilli genotypes

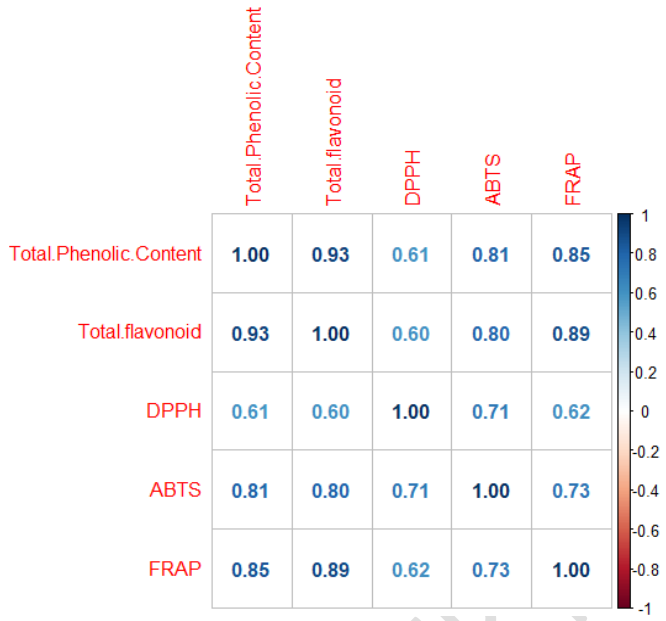

Fig. 2. Correlation coefficient between total phenol (TP), total flavonoid (TF), diphenyl-2-picrylhydrazyl (DPPH), azinobisethylbenzothiazoline-6-sulphonic acid (ABTS) and ferric reducing antioxidant power (FRAP

Conclusion

The present study concludes that chilli genotypes collected from different agro-ecological zones of India displayed high content of total phenols, flavonoids and antioxidant activities. Three genotypes viz. IC-561635, CITH-HP-22 and IC-561731 exhibited highest values for all the antioxidant assays. Clustering analysis revealed genotypes exhibited different ranges of antioxidants which may be used for quality breeding in Capsicum. In this context, Chilli genotype could be an important source of raw material for emerging Nutra pharmaceutical industries and brreeding new Capsicum varieties with high antioxidant contents.

Comment [O.I.22]: breeding

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