ICAR-Consortia Research Platform

Biofortification in selected crops for nutritional security

Crop: Sorghum

Objectives

1. To profile sorghum cultivars and germplasm accessions for grain micronutrients and identify suitable donors
2. To develop improved sorghum cultivars with high grain iron and zinc density through conventional breeding
3. To identify SNP-trait associations for high grain iron and zinc contents in sorghum through candidate gene-based association mapping

Nutrient composition of sorghum grain compared to fine cereals (per 100 g)

Nutrient	**Sorghum**	**Wheat** (whole)	**Rice** (raw, milled)
Carbohydrate(g)	72.6	71.2	78.2
Protein (g)	10.4	11.8	6.8
Fat (g)	1.9	1.5	0.5
Energy (KCal)	349	346	345
Crude fibre (g)	1.6	1.2	0.2
Mineral (g)	1.6	1.5	0.6
Ca (mg)	25	41	10
Iron (mg)	4.1	5.3	0.7
Zinc (mg)	1.6	2.7	1.3
Phosphorus (mg)	222	306	160
Copper (mg)	0.46	0.68	0.14
Manganese (mg)	0.78	2.29	0.59
Carotene (µg)	47	64	0
Thiamin (mg)	0.4	0.4	0.4
Niacin (mg)	4.3	5.1	4.3
Riboflavin (mg)	0.2	0.1	0

(Source: Nutritive value of Indian foods, NIN, 2007)

Nutritional profiling of popular cultivars for grain iron and zinc content

Sl.No.	**Genotype**	**Iron (ppm)**	**Zinc (ppm)**
Hybrids			
1	CSH 14	21.45	15.47
2	CSH 15R	20.13	19.52
3	CSH 16	33.86	18.74
4	CSH 18	21.33	19.70
5	CSH 23	29.40	17.10

6	CSH 25	23.54	17.71
7	CSH 30	24.84	19.90
Varieties			
8	APK 1	30.05	14.80
9	BSR 1	35.91	19.73
10	CO(S) 28	24.88	14.90
11	CSV 10	26.21	22.41
12	CSV 12	42.98	22.00
13	CSV 13	30.97	14.79
14	CSV 14R	20.25	19.70
15	CSV 15	28.10	15.38
16	CSV 17	32.85	18.87
17	CSV 18	18.69	18.47
18	CSV 20 (SPV 1616)	23.86	14.70
19	CSV 216R	21.16	14.77
20	CSV 22R	19.02	15.83
21	CSV 23 (SPV 1714)	22.40	14.98
22	CSV 26R	21.13	16.70
23	CSV 27	24.25	13.88
24	CSV 29R	18.11	17.49
25	CSV 7R	25.77	26.65
26	CSV 8R	22.25	17.02
27	DSV 1	29.45	24.95
28	DSV 3 (ICSV 745)	26.58	19.40
29	DSV 4	28.41	21.58
30	DSV 5	28.15	26.20
31	DSV 6	29.82	19.05
32	GJ 35	25.35	14.65
33	GJ 36	29.07	19.83
34	GJ 37	29.38	19.43
35	GJ 38	20.93	18.88
36	GJ 39	28.02	17.18
37	GJ 40	23.23	15.18
38	GJ 9	24.02	18.51

39	JJ 1022	23.93	18.84
40	JJ 1041	21.10	19.61
41	JJ 741	20.62	17.45
42	JJ 938	26.66	13.07
43	K 11	26.72	20.84
44	K 8	27.67	16.67
45	M 35-1	18.21	23.28
46	Man T 1	33.46	27.72
47	NSV 13	36.46	20.57
48	NTJ 3	27.43	21.03
49	P. Moti (PVR-396/SPV-1411)	25.19	28.57
50	Parbhani Dagadi	24.53	22.05
51	Payur 2	34.94	23.47
52	Phule Anuradha	21.82	21.54
53	PhuleChitra	25.72	17.71
54	PhuleMaulee	19.03	21.97
55	PhuleRevathi	22.42	14.50
56	PhuleRohini	42.44	36.29
57	PhuleSuchitra	21.18	18.18
58	Phule Uttara	27.62	22.53
59	PhuleVasudha	28.61	17.52
60	PKV Ashwini (Wani 11/6)	25.19	21.42
61	PKV Kranthi (AKSV 13R)	24.49	17.89
62	Pratap Jowar-1430 (SPV 1430)	19.24	14.13
63	PSV 1	27.29	18.01
64	PSV 2	32.47	18.54
65	PVK 400	28.27	15.82
66	PVK 801 (P. Sweta, SPV 1333)	28.41	21.10
67	PVK 809 (SPV 1474)	19.67	14.62
68	Selection 3	18.63	18.18
69	SPV 462	20.47	13.89
70	SSV 84	21.52	19.14
71	Surat 1	18.07	17.45
72	Swathi	29.18	18.09
Parental/Breeding lines & Farmers' varieties			

73	104B	20.41	16.61
74	2077B	26.48	13.63
75	2219B	25.53	14.08
76	279B	22.28	12.83
77	27B	28.37	13.67
78	296B	25.97	15.54
79	415B	26.01	16.34
80	463B	20.61	13.38
81	7B	25.26	12.53
82	AKMS 14B	27.59	14.33
83	ICSB 38	33.71	15.63
84	IMS 9B	25.67	17.26
85	PMS 28B	26.17	16.40
86	AKR 150	26.33	16.92
87	AKR 354	20.01	12.61
88	AKR 73	27.24	15.63
89	BP 53	23.92	17.61
90	C 43	25.25	18.71
91	CB 11	22.20	15.49
92	CB 33	15.82	14.15
93	CS 3541	33.85	24.99
94	Indore 12	31.60	19.32
95	M 148-138	15.92	16.50
96	MR 750	39.19	18.47
97	PSB 3	32.95	18.42
98	PSB 9	35.58	18.94
99	PSR 23	27.84	17.51
100	PSR 34	24.58	23.59
101	PVR 453	14.77	14.50
102	RS 29	22.14	17.59
103	RS 585	22.36	18.02
104	RS 627	22.09	13.93
105	RS 673	17.00	16.32
106	SPV 2170	29.84	28.18
107	SPV 2362	22.61	17.21

108	SPV 2296	20.84	15.87
109	SPV 2348	24.46	17.15
110	ICSR 14001	30.22	29.18
111	BagdalPeeliJawar	23.64	20.25
112	BarsiJowar	24.68	15.74
113	Mogal goal Jowar	20.28	15.74
114	KodamurkaJola	21.69	18.63

[Method: Atomic Absorption Spectroscopy (AAS)]