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PS Yevle
M.Sc. Student, Department of Biochemistry, Mahatma Phule Krishi Vidyapeeth, Rahuri, Ahilyanagar, Maharashtra, India

BR Bhite
Assistant Professor, Department of Biochemistry, Mahatma Phule Krishi Vidyapeeth, Rahuri, Ahilyanagar, Maharashtra, India

PK Lokhande
Professor and Head, Department of Biochemistry, Mahatma Phule Krishi Vidyapeeth, Rahuri, Ahilyanagar, Maharashtra, India

VP Kad
Head, Department of Food Science and Technology, Mahatma Phule Krishi Vidyapeeth, Rahuri, Ahilyanagar, Maharashtra, India

VT Sarate
Department of Biochemistry, Post Graduate Institute, Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra, India

Corresponding Author:
PS Yevle
M.Sc. Student, Department of Biochemistry, Mahatma Phule Krishi Vidyapeeth, Rahuri, Ahilyanagar, Maharashtra, India

Screening of promising wheat genotypes for nutritional quality

PS Yevle, BR Bhite, PK Lokhande, VP Kad and VT Sarate

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Abstract
The present research work entitled, "Screening of promising wheat genotypes for nutritional quality" was undertaken with the objective to evaluate the promising wheat genotypes for better quality and nutritional parameters.

The moisture, protein, crude fat, total ash, crude fiber and carbohydrates content of twenty five promising wheat genotype's along with two check verities i.e. Phule Samadhan (NIAW 1994) and MACS 6222 were ranging from 8.00 to 12.73 per cent, 9.55 to 12.97 per cent, 1.00 to 2.66 per cent, 1.00 to 3.20 per cent, 0.75 to 1.97 per cent and 69.83 to 77.30 per cent, respectively.

For quality parameters, grain hardness ranging from (8.03 to 10.93 kg/grain) with mean value 9.78 kg/grain. Grain appearance score was ranging from 4.50 to 7.50 with mean value 6.16. Hectoliter weight ranging from (71.53 to 83.82 kg/ha) with mean value 79.92 kg/ha and the promising wheat genotype HI 1697 (83.52 kg/ha) recorded significantly higher hectoliter weight. Thousand grain weight ranged from 27.84 to 50.54 g with mean value 39.92 g and the promising wheat genotype GW 562 (50.54 g) recorded higher thousand grain weight. Phenol test score ranged from 3.50 to 9.00 with mean value 6.65 and promising wheat genotype HD 2864 recorded lowest phenol test score (3.50**)** which is desirable for chapatti quality. Sedimentation value ranged from 36.00 to 63.00 ml with mean value 50.93 ml and promising wheat genotype PBW 952 (63.00 ml) recorded higher sedimentation value. No incidence of yellow berry was recorded in HD 2932, WSM 141, LOK 83, HI 633 and MP 1402 respectively.

For nutritional parameters, wet and dry gluten ranged from 27.60 to 32.73 per cent and 9.20 to 12.90 per cent and promising wheat genotype LOK 83 (37.00%) recorded lowest gluten content. Iron and zinc content ranged from 3.01 to 4.86 mg $100g^{-1}$ and 2.12 to 3.87 mg $100g^{-1}$. Promising wheat genotype HD 2864 (4.86 mg $100g^{-1}$) showed higher iron content whereas, released variety Phule Samadhan (NIAW 1994) (3.87 mg$100g^{-1}$) recoded higher zinc content. Starch content ranged from 62.83 to 72.08 per cent with mean vale 67.91 per cent and check Phule Samadhan (NIAW 1994) (72.08%) recorded higher starch content. Reducing sugar, non- reducing sugar and total sugar content ranged from 0.53 to 1.76, 0.08 to 2.32 and 1.16 to 3.34 per cent respectively.

Keywords: Hectolitre weight, sedimentation value, phenol test

Introduction
Wheat (*Triticum aestivum* L.), a member of the Poaceae (Gramineae) family, genus (*Tritium*) and most vital cereal crop globally in terms of both production and human consumption due to its adaptability to all types of terrain and different climates (Seadh *et al.,* 2009) [10]. Global wheat production is projected to be approximately 787 million tones. In India, the wheat cultivation area has reached around 330.8 lakh hectares in 2024-25, showing an increase of 6.42 lakh hectares compared to 324.38 lakh hectares in the previous year. Notable increases in sown area are observed in Uttar Pradesh, Madhya Pradesh and Rajasthan. India remains the world's second-largest wheat producer after China, contributing about 13.5% to the global output. Within the country, Uttar Pradesh, Madhya Pradesh and Punjab are the top three wheat-producing states during the 2023-24 season. The total wheat production in India for the year 2024-25 is estimated at 115.43 million tonnes. In Maharashtra, wheat occupied an area of 11.50 lakh hectares, producing 22.10 lakh tones in the 2023-24 season (Anonymous, 2025) [1].

Wheat is the second important food crop in the developing world after rice and major component of the human diet. Wheat provides proteins, carbohydrates (high energy) and minerals which are important for the development of the immunity (Shi *et al*., 2010) [11].

However, it is known to be limited in certain essential amino acids, particularly lysine and tryptophan. Despite this, wheat provides over two-thirds of the required iron and nearly one-third of the calcium for adults across different socio-economic groups in India. Wheat flour is also used for the preparation of food products like bread, noodles and biscuits (Gao *et al*., 2010) [5]. The wheat grain contains 2-3% germ, 13-17% bran and 80-85% endosperm (all constituents converted to a dry matter basis) (Sramkova *et al*., 2009; Belderok *et al*., 2000) [12, 3]. Wheat contains a diverse array of bioactive compounds that may be contribute to its antioxidant capacity. These bioactive compounds include carotenoids, tocopherols, tocotrienols, phenolic acids, phytic acid, phytosterols and flavonoids (Yu *et al*., 2005) [13]. The endosperm contains starch and approximately 10-14% protein mainly gluten (80%). The germ is rich in lipids, fiber, vitamins, minerals and phytonutrients. Bran consists of several cell layers and contains a significant amount of fiber. The bran includes the aleurone layer, which separates the endosperm from the bran layers. The aleurone layer is rich in proteins, vitamins and phytonutrients. Thus, refined wheat flour, which is made primarily from the endosperm is mainly starch and has limited amounts of fiber, proteins, lipids, vitamins, minerals and other phytonutrients.

In India, wheat flour is predominantly consumed in the form of unleavened flatbreads such as chapati, puri and in southern regions as paro, naan and batura. Wheat flour is also fundamental in producing sourdough breads, which are commonly prepared in artisan bakeries using a mixture of flour and water fermented by baker's yeast. This fermentation process is facilitated by lactic acid bacteria and yeast, which contribute to both leavening and flavor development (Catzeddu, 2011) [4].

Hence, there is a need to assess the physico-chemical and nutritional parameters of newly released promising wheat genotypes for the development of value-added products, ensuring better health outcomes and addressing food and nutritional security among the population. Although wheat is widely consumed across India, especially in the form of chapattis and other traditional foods and limited information available on the nutritional characterization of newly developed or promising wheat genotypes. Hence, systematic evaluation of such genotypes is essential to identify nutritionally superior cultivars. In this context, the present research entitled "Screening of promising wheat genotype for nutritional quality" was undertaken to study the variation among genotypes with respect to their nutritional composition and quality traits. Hence, with these perspectives in mind, the present study was undertaken with the following objectives:

1. To estimate the proximate composition of the promising wheat genotypes.
2. To evaluate the promising wheat genotypes with low gluten content and better nutritional quality as well as minerals content.

Materials and Methods

The promising wheat genotypes was collected from the Wheat Specialist Agriculture Research Station, Niphad. The experiment was conducted in the Department of Biochemistry, Post Graduate Institute, Mahatma Phule Krishi Vidyapeeth, Rahuri.

Table 1: List of promising wheat genotypes

Sr. No.	Name of genotypes	Sr. No.	Name of genotypes
1	HD 2864	15	LOK 83
2	DBW 464	16	HI 1698
3	HD 2932	17	HI 1696
4	HI 1697	18	MP 3598
5	WH 1338	19	HI 1699
6	GW 567	20	HI 1633
7	WSM 141	21	UAS 3033
8	DBW 463	22	UAS 3032
9	MACS 6868	23	MACS 6854
10	GW 562	24	PBW 952
11	MP 3599	25	MP 1402
12	NIAW 4621	26	PHULE SAMADHAN(C)
13	CG 1061	27	MACS 6222(C)
14	NIAW 4624		

Proximate Analysis of grain sample: Moisture, ash, protein, Fat and Crude fibre contents of promising wheat genotypes were determined by method described by AOAC (2000) [2]. Available Carbohydrate was determined by difference according to Onwuka (2005) [7].

Quality parameters

Grain hardness (kg grain^{-1})

It was measured by pressing 10 average sized well fitted grains under the grain hardness tester (Manufactured by Kiya Seisakusho Ltd., Japan). Force was applied to crush grain by turning the knob. The force in kg displayed on dial at the time of crushing the grain was noted.

Hectolitre weight (kg/hl)

HW of wheat grains were recorded by using the hectolitre instrument developed by the Quality Group Scientists of Directorate of Wheat Research (ICAR), Karnal and the HW of the wheat grains was recorded as kg/hl.

Thousand grain weight (g)

This was repeated four times and then the four values obtained were averaged and multiplied by ten to get thousand grain weight.

Phenol test for grains

Phenol test of grains was determined according the procedure given by Jaiswal and Agrawal, (1995) [6].

Sedimentation value (ml)

Sedimentation value of flour was determined according to procedure given by Mishra *et al.* (1998) [9].

Yellow berry incidence (%)

Incidence of YB was recorded by observing yellow spots on the grain kernels on percentage basis. About 200-300 wheat grains were randomly withdrawn and placed on a very clean white filter paper and observed for yellow spots and the results were expressed on per cent basis.

Nutritional Parameters: Nutritional Parameters such as Gluten and Minerals (Iron and Zinc) were estimated by using standard method AOAC (2000) [2] of promising wheat genotypes and the starch content was determined by the method of Mc Cready *et al*. (1950) [8].

Statistical analysis: Statistical data analysis was carried out as per factorial Randomized Block Design.

Results and Discussion

The data of proximate compositions of promising wheat genotype were presented in Table 2.

Moisture (%)

Moisture content is one of the most critical factor that determine the quality of wheat grains. The data on moisture content in the grains of wheat genotypes are presented in Table 2 showed significant variation in moisture content which ranged from 8.00 to 12.73 per cent with a mean value of 10.59 per cent. The variety Phule Samadhan (12.73%) recorded significantly highest moisture content while genotype MP 1402 (8.00%) showed lower moisture content as compared to all other genotypes respectively.

Crude protein (%)

Protein content is an important quality parameter that decides the suitability of wheat for a particular end use. The data of protein cantent of promising wheat genotype was presented in Table 2 showed significant variation and the protein content in twenty seven wheat genotypes ranged from 9.55 to 12.97 per cent with average value of 11.76 per cent. The promising wheat genotype HI 1633 (12.97%) recorded significantly higher protein content which was on par with DBW 463 (12.77%) and MACS 6868 (12.66%) respectively where as, promising wheat genotypes GW 562 (9.55%) recorded lowest protein content.

Crude fat (%)

The data recorded for the crude fat content of different wheat genotypes was presented in Table 2 depicted that, wheat genotypes showed significant variation in crude fat content ranged from 1.00 to 2.66 per cent and with overall mean 1.76 per cent. The promising wheat genotypes DBW 464 (2.66%) recorded significantly higher crude fat as compaired to other genotypes respectively.

Total Ash (%)

The data of total ash (%) of promising wheat genotypes was presented in Table 2 showed significant variation and it was ranged from 1.00 to 3.20 per cent with average value 1.64 per cent. The promising wheat genotypes LOK 83 (3.20%) recorded significantly higher total ash as compared to all other genotypes respectively.

Crude fiber (%)

The data of crude fiber content of different promising wheat genotypes was presented in Table 2 depicted that, the crude fiber content of promising wheat genotypes showed significant variations and ranged from 0.75 to 1.97 per cent with average value 1. 33 per cent. The released check wheat variety MACS 6222 (1.97%) recorded significantly higher crude fiber as compared to all other genotypes respectively.

Carbohydrates (%)

The data of carbohydrate content of different promising wheat genotypes was presented in Table 2 showed that, the carbohydrate content in the grains of promising wheat genotypes showed significant variations and it was ranged from 69.83-77.30 per cent with a mean of 72.91 per cent. The promising wheat genotype NIAW 4621 (77.30%) recorded significantly higher carbohydrate content which was on par with PWB 592 (76.50%) and GW 562 (76.11%) respectively.

Table 2: Proximate composition of wheat genotypes

Sr. No	Name of genotypes	Moisture content (%)	Crude protein (%)	Crude fat content (%)	Total Ash (%)	Crude fibre (%)	Carbohydrates (%)
1	HD 2864	10.57	11.93	1.56	1.40	1.65	72.89
2	DBW 464	12.41	12.26	2.66	1.60	1.00	70.07
3	HD 2932	12.25	11.40	2.36	1.60	1.80	70.59
4	HI 1697	10.68	12.35	1.00	1.20	1.90	72.87
5	WH 1338	12.63	12.29	2.20	1.20	1.84	69.83
6	GW 567	12.09	12.27	2.40	1.20	1.79	70.24
7	WSM 141	8.10	11.20	1.80	1.40	1.75	75.76
8	DBW 463	8.70	12.77	1.60	1.00	1.59	74.34
9	MACS 6868	11.29	12.66	1.20	1.20	0.85	72.80
10	GW 562	10.29	9.55	1.00	2.00	1.05	76.11
11	MP 3599	10.87	11.20	1.40	2.20	0.75	73.58
12	NIAW 4621	8.16	11.34	1.00	1.40	0.79	77.30
13	CG 1061	10.75	12.32	1.44	2.20	0.94	72.35
14	NIAW 4624	8.82	11.39	2.20	1.20	1.05	75.35
15	LOK 83	8.17	11.33	2.60	3.20	1.09	73.60
16	HI 1698	11.64	12.38	1.00	1.40	0.75	72.83
17	HI 1696	9.04	12.12	2.40	2.60	0.85	73.00
18	MP 3598	12.38	10.95	2.20	1.20	1.20	72.07
19	HI 1699	12.43	11.59	1.20	1.20	1.39	72.19
20	HI 1633	10.74	12.97	2.20	1.40	1.44	71.24
21	UAS 3033	10.19	11.87	1.60	1.60	1.44	73.30
22	UAS 3032	12.37	11.23	1.80	1.80	1.60	71.20
23	MACS 6854	10.88	11.48	2.20	2.00	1.69	71.75
24	PBW 952	8.33	10.87	1.60	1.60	1.10	76.50
25	MP 1402	8.00	12.07	2.20	1.80	1.05	74.88
26	Phule Samadhan©	12.73	11.33	1.60	2.20	1.80	70.35
27	MACS 6222©	11.37	12.38	1.20	1.60	1.97	71.48
	Range	8.00-12.73	9.55-12.97	1.00-2.66	1.00-3.20	0.75-1.97	69.83-77.30
	Mean	10.59	11.76	1.76	1.64	1. 33	72.91
	S.E. ±	0.20	0.11	0.02	0.02	0.02	0.62
	CD at 5%	0.55	0.32	0.06	0.06	0.05	1.77
	CV (%)	1.53	1.68	2.10	2.09	2.03	1.47

Grain hardness (kg grain^{-1})
The data on grain hardness of the promising wheat genotypes along with two check varieties was presented in Table 3 showed significant variations and ranged from 8.03-10.93 kg grain^{-1} with mean value 9.78 kg grain^{-1}. The check variety MACS 6222 (10.93 kg grain^{-1}) recorded significantly higher grain hardness which was on par with WH 1338, MACS 6854, WSM 141, LOK 83 and UAS 3032 (10.91, 10.86, 10.85, 10.84 and 10.75 kg grain^{-1}) respectively where as the genotype GW 562 (8.03 kg grain^{-1}) was recorded lowest grain hardness.

Grain appearance score
The data of Grain appearance score of promising wheat genotypes was presented in Table 3 showed significant variations and ranged from 4.50 to 7.50 with mean value 6.16. The promising wheat genotype DBW 464 (7.50) recorded significantly higher grain appearance score as compared to all other genotypes, respectively.

Hectoliter weight (kg/hl)
The data of hectoliter weight of promising wheat genotypes was presented in Table 3 depicted that, the promising wheat genotype showed significant variation and ranged from 71.53 to 83.82 kg/hl with average mean value 79.92 kg/hl. The promising wheat genotype HI 1697 (83.82 kg/hl) recorded significantly higher hectoliter weight which was at par with HI 1698, HD 2864, HI 1699, HI 1696 and Phule Samadhan (83.44, 83.15, 82.37, 81.78 and 81.24 kg/hl) respectively.

Thousand grain weight (g)
The data of thousand grain weight of promising wheat genotypes was presented in Table 3 depicted that, the thousand grain weight showed significant variation and ranged from 27.48-50.54 g, with overall mean 39.92 g. The promising wheat genotype GW 562 (50.54 g) recorded significantly higher thousand grain weight which was at par with HI 1698 and Phule Samadhan (49.58 and 49.57g) respectively.

Phenol test
The data of phenol test of the promising wheat genotypes showed significant variation and presented in Table 3 showed that, the phenol test score of the promising wheat genotypes ranged between 3.50 to 9.00 score with overall mean 6.65. The promising wheat genotype HD 2864 (3.50) recorded significantly low phenol score whereas genotype DBW 463 and PBW 592 (9.00) recorded significantly higher phenol test score.

Sedimentation value (ml)
The data of sedimentation value of twenty five promising wheat genotypes along with two check varieties was presented in Table 3 depicted that, the sedimentation value showed significant variations and ranged between 36.00 to 63.00 ml with overall mean 50.93ml. The promising wheat genotype PBW 952 (63.00ml) recorded significantly higher sedimentation value as compared to all other promising wheat genotype.

Yellow berry (%)
The data of yellow berry of promising wheat genotypes was presented in Table 3 showed that, the yellow berry incidence show significant variation and ranged between (0.00 to 6.00%) with mean value 1.43 per cent. The promising wheat genotypes HI 1697 and UAS 3032 (6.00%) recorded significantly higher yellow berry incidence as compared to all other genotypes. The values recorded per hundred grain showed yellow berry prevalence affecting the grain appearance score.

Table 3: Quality parameter of wheat genotypes

Sr. No	Name of genotypes	Grain hardness (kg grain^{-1})	Grain Appearance Score (1 to 10)	Hectoliter weight (kg/hl)	Thousand grain weight (g)	Phenol test score (1to 10)	Sediment-ation value(ml)	Yellow Berry (%)
1	HD 2864	9.18	5.75	83.15	39.93	3.50	47.00	5.50 (2.55)
2	DBW 464	9.62	7.50	76.69	31.54	8.50	50.50	0.50 (1.22)
3	HD 2932	10.09	4.50	76.22	33.30	3.75	57.50	0.00 (1.00)
4	HI 1697	9.71	6.75	83.82	44.26	3.75	46.00	6.00 (2.65)
5	WH 1338	10.91	5.25	78.28	39.81	4.00	51.00	1.50 (1.58)
6	GW 567	10.34	6.75	81.24	40.12	7.00	47.00	0.00 (1.00)
7	WSM 141	10.85	6.75	80.71	38.93	5.25	51.00	0.00 (1.00)
8	DBW 463	9.59	6.75	76.99	36.95	9.00	57.00	1.00 (1.41)
9	MACS 6868	9.37	5.25	78.8	41.26	8.50	54.50	3.50 (2.12)
10	GW 562	8.03	5.25	80.11	50.54	8.50	36.00	0.50 (1.22)
11	MP 3599	9.41	6.50	79.61	38.16	4.75	40.00	1.50 (1.58)
12	NIAW 4621	9.47	5.50	80.95	36.10	8.50	55.50	1.50 (1.58)
13	CG 1061	8.12	6.75	79.79	38.41	5.25	45.50	1.00 (1.41)
14	NIAW 4624	9.69	6.50	81.48	44.37	8.50	51.00	0.50 (1.22)
15	LOK 83	10.84	4.75	74.67	36.00	7.50	51.00	0.00 (1.00)
16	HI 1698	10.48	6.25	83.44	49.58	6.25	43.50	2.00 (1.73)
17	HI 1696	8.07	6.50	81.78	39.47	7.75	43.00	1.00 (1.41)
18	MP 3598	9.53	6.50	77.46	40.09	8.00	50.00	1.50 (1.58)
19	HI 1699	9.18	6.75	82.37	42.93	3.75	47.50	0.50 (1.22)
20	HI 1633	9.11	6.25	80.36	40.02	8.00	57.00	0.00 (1.00)
21	UAS 3033	9.38	6.00	75.66	42.51	8.50	56.00	0.50 (1.22)
22	UAS 3032	10.75	6.00	71.53	27.48	8.00	46.00	6.00 (2.65)

Table 3: Contd….

Sr. No	Name of genotypes	Grain hardness (kg grain^{-1})	Grain Appearance Score (1 to 10)	Hectoliter weight (kg/hl)	Thousand grain weight (g)	Phenol test score (1to 10)	Sediment-ation value(ml)	Yellow Berry (%)
23	MACS 6854	10.86	6.50	80.26	40.38	4.75	51.00	1.00 (1.41)
24	PBW 952	9.72	6.25	76.81	36.07	9.00	63.00	1.00 (1.41)
25	MP 1402	10.34	5.50	74.94	35.80	5.25	58.50	0.00 (1.00)
26	Phule Samadhan©	10.48	6.75	81.24	49.57	6.25	60.00	1.00 (1.41)
27	MACS 6222©	10.93	6.50	80.71	44.36	7.75	59.00	1.00 (1.41)
	Range	8.03-10.93	4.50-7.50	71.53-83.82	27.48-50.54	3.50-9.00	36.00-63.00	0.00-6.00
	Mean	9.78	6.16	79.92	39.92	6.65	50.93	1.43
	S.E. ±	0.11	0.06	0.88	0.38	0.08	0.47	0.01
	CD at 5%	0.32	0.16	2.50	1.08	0.23	1.33	0.03
	CV (%)	2.00	1.61	1.92	1.65	2.15	1.58	7.29

For grain appearance and phenol test score was given out of 10.0 (1 to 10).

Wet gluten (%)

The data of wet gluten (%) of promising wheat genotypes was presented in Table 4 depicted that, the wet gluten showed significant variation and ranged between 27.60 to 32.73 per cent with mean value 31.00 per cent. The promising wheat genotype HI 1633 (32.73%) recorded significantly higher wet gluten (%) which was on par with GW 562, HI 1696, MACS 6222, HI 1697 and DBW 464 (32.70, 32.63, 32.60, 32.24 and 32.10%) respectively.

Dry gluten (%): The data of dry gluten of promising wheat genotypes presented in Table 4 showed significant variation and ranged between 9.20-12.90 per cent with mean value 11.31 per cent. The promising wheat genotype DBW 464 (12.90%) recorded significantly higher dry gluten (%) followed by HI 1633 (12.60%).

Table 4: Wet and dry gluten content of wheat genotypes

Sr. No	Name of Genotypes	Gluten (%)	
		Wet	Dry
1	HD 2864	31.60	11.30
2	DBW 464	32.10	12.90
3	HD 2932	29.50	10.30
4	HI 1697	32.24	11.99
5	WH 1338	31.90	12.23
6	GW 567	30.20	11.73
7	WSM 141	31.40	11.57
8	DBW 463	31.97	12.18
9	MACS 6868	29.20	10.67
10	GW 562	32.70	12.33
11	MP 3599	31.10	11.33
12	NIAW 4621	31.30	11.40
13	CG 1061	31.60	12.01
14	NIAW 4624	28.60	9.79
15	LOK 83	27.80	9.20
16	HI 1698	31.30	11.07
17	HI 1696	32.63	12.03
18	MP 3598	31.00	11.70
19	HI 1699	30.20	10.60
20	HI 1633	32.73	12.60
21	UAS 3033	30.30	10.73
22	UAS 3032	29.50	9.94
23	MACS 6854	29.60	10.53
24	PBW 952	31.90	11.60
25	MP 1402	30.20	9.84
26	PHULE SAMADHAN©	31.90	11.70
27	MACS 6222©	32.60	12.07
	Range	27.60-32.73	9.20-12.90
	Mean	31.00	11.31
	S.E. ±	0.26	0.10
	CD at 5%	0.73	0.29
	CV (%)	1.50	1.54

Iron and zinc contents of wheat

The data of iron and zinc (mg 100 g^{-1}) was presented in Table 5 showed that, promising wheat genotype has significant variation for iron and zinc content. The range of iron content was 3.01-4.86 mg 100 g^{-1} with mean value 3.94 mg 100 g^{-1}. The promising wheat genotype HD 2864 (4.86 mg 100 g^{-1}) recorded significantly higher iron content which was as par with WSM 141, Phule Samadhan, UAS 3032 and GW 567 (4.85, 4.84, 4.82 and 4.75 mg 100 g^{-1}), respectively. Whereas for zinc content, the range was 2.12-3.87 mg 100g^{-1} with mean value 3.12 mg 100g^{-1}. The promising wheat variety Phule Samadhan (3.87 mg 100 g^{-1}) recorded significantly higher zinc content which was as par with UAS 3033 and UAS 3032 (3.82 and 3.80 mg 100 g^{-1}) respectively.

Table 5: Iron and zinc contents of wheat genotypes

Sr. No	Name of Genotypes	Minerals (%)	
		Iron	Zinc
1	HD 2864	4.86	2.71
2	DBW 464	3.47	2.28
3	HD 2932	3.76	3.23
4	HI 1697	3.39	3.62
5	WH 1338	3.27	3.61
6	GW 567	4.75	2.39
7	WSM 141	4.85	2.21
8	DBW 463	3.54	2.73
9	MACS 6868	3.30	2.86
10	GW 562	3.79	3.36
11	MP 3599	3.01	2.73
12	NIAW 4621	3.30	3.12
13	CG 1061	3.95	2.38
14	NIAW 4624	4.66	3.66
15	LOK 83	4.24	2.52
16	HI 1698	4.58	3.66
17	HI 1696	3.73	3.60
18	MP 3598	3.83	2.12
19	HI 1699	3.11	3.73
20	HI 1633	4.44	3.58
21	UAS 3033	3.64	3.82
22	UAS 3032	4.82	3.80
23	MACS 6854	3.93	2.83
24	PBW 952	4.44	3.31
25	MP 1402	3.52	3.33
26	PHULE SAMADHAN ©	4.84	3.87
27	MACS 6222©	3.41	3.21
	Range	3.01-4.86	2.12-3.87
	Mean	3.94	3.12
	S.E. ±	0.04	0.03
	CD at 5%	0.12	0.09
	CV (%)	1.83	1.82

Starch (%): The data of starch (%) of promising wheat genotype was presented in Table 6 depicted that, the promising wheat genotype showed significant variation for starch content and the range was 62.83-72.08 per cent with mean value 67.91 per cent. The wheat variety Phule Samadhan (72.08%) recorded significantly higher starch content which was as par with promising wheat genotypes *viz.* HI 1696, UAS 3033, MP 1402, NIAW 4621 and CG 1061 (71.85, 71.85, 71.85, 71.53 and 70.56%), respectively.

Sugar contents (%)
The data of sugar content (reducing, non-reducing and total sugar) of promising wheat genotype was presented in Table 6 showed significant variation for sugar content.

Reducing sugar (%)
The reducing sugar content in the promising wheat genotype ranged between 0.53- 1.76 per cent with mean value 1.12 per cent. The promising wheat genotype NIAW 4621 (1.76%) recorded significantly higher reducing sugar (%) followed by MACS 6222 (1.73%).

Non-reducing sugar (%)
The non-reducing sugar ranged between 0.08- 2.32 per cent with mean value 1.43 per cent. The promising wheat genotype GW 562 (2.32%) recorded significantly higher non-reducing sugar content followed by HI 1699 (2.31%).

Total sugar (%)
The total sugar content was ranged between 1.16 to 3.34 per cent with mean value 2.55 per cent. The check variety MACS 6222 (3.34%) recorded significantly higher total sugar content followed by promising wheat genotype MP 3598, HI 1699, GW 562, GW 567 and HI 1697 (3.33, 3.31, 3.30, 3.29 and 3.27%) respectively.

Table 6: Starch and sugar contents in wheat grains

Sr. No	Name of Genotypes	Starch (%)	Sugar (%)		
			Reducing	Non-Reducing	Total
1	HD 2864	63.80	0.75	0.66	1.41
2	DBW 464	67.34	0.80	0.36	1.16
3	HD 2932	68.31	0.96	0.60	1.56
4	HI 1697	62.83	1.29	1.98	3.27
5	WH 1338	69.27	1.42	0.08	1.50
6	GW 567	66.37	1.13	2.16	3.29
7	WSM 141	67.02	0.97	2.10	3.08
8	DBW 463	65.73	0.53	1.02	1.55
9	MACS 6868	67.34	1.00	1.91	2.91
10	GW 562	64.12	0.97	2.32	3.30
11	MP 3599	68.63	1.15	1.74	2.88
12	NIAW 4621	71.53	1.76	0.23	1.99
13	CG 1061	70.56	1.58	1.31	2.89
14	NIAW 4624	66.37	0.86	2.22	3.08
15	LOK 83	66.05	1.00	1.93	2.93
16	HI 1698	63.47	1.30	0.45	1.75
17	HI 1696	71.85	0.72	1.06	1.78
18	MP 3598	71.21	1.58	1.75	3.33
19	HI 1699	70.56	1.00	2.31	3.31
20	HI 1633	69.92	0.92	1.99	2.91
21	UAS 3033	71.85	0.86	2.13	2.99
22	UAS 3032	63.80	0.76	2.14	2.90
23	MACS 6854	67.34	1.15	1.77	2.92
24	PBW 952	66.70	0.86	0.90	1.76
25	MP 1402	71.85	1.43	1.55	2.98
26	Phule Samadhan ©	72.08	1.72	0.27	1.99
27	MACS 6222©	67.73	1.73	1.61	3.34
	Range	62.83-72.08	0.53-1.76	0.08-2.32	1.16-3.34
	Mean	67.91	1.12	1.43	2.55
	S.E. ±	0.56	0.01	0.03	0.03
	CD at 5%	1.58	0.03	0.07	0.09
	CV (%)	1.42	1.79	3.17	2.14

Conclusion
The genotypes *viz.*, HI 1633 (Highest crude protein), DBW 464 (Highest crude fat%), MACS 6222 (Highest crude fiber), NIAW 4621 (Highest carbohydrate content), HI 1697 (Highest Hectoliter weight), GW 562 (Highest thousand grain weight), PBW 952 (Highest Sedimentation value), HD 2864 (Highest Iron), Phule Samadhan (Highest zinc), HD 2864 (lowest Phenol test score) and LOK 83 (low gluten content) were promising wheat genotypes.
Hence, these promising genotypes will be utilized in the breeding programme for developing new wheat varieties having better quality as well as essential minerals for bio fortification.

References
1. Anonymous. Annual report 2024-25. Ministry of Agriculture and Farmers Welfare, Government of India, New Delhi; 2025.
2. AOAC. Official methods of analysis. 15th ed. Association of Official Analytical Chemists, Washington DC; 2000.

3. Belderok B, Mesdag H, Donner DA. Bread-making quality of wheat. Springer, New York; 2000.
4. Catzeddu P. Sourdough fermentation in bread-making: a review. Ital J Food Sci. 2011;23(2):97-106.
5. Gao L, Ma W, Chen J, Wang K, Li J, Wang S, Bekes F, *et al*. Characterization and comparative analysis of wheat high molecular weight glutenin subunits by SDS-PAGE, RP-HPLC, HPLC and MALDI-TOF-MS. J Agric Food Chem. 2010;58(5):2777-2786.
6. Jaiswal JP, Agrawal RL. Variety purity determination in rice: modification of the phenol test. Seed Sci Technol. 1995;23:33-42.
7. Onwuka GI. Food analysis and instrumentation: theory and practice. Naphtali Print, Lagos; 2005.
8. McCready RM, Guggolz J, Silviera V, Owens HS. Determination of starch and amylase in vegetables. Anal Chem. 1950;22(9):1156-1158.
9. Mishra BK, Gupta RK, Ram S. Protocol for evaluation of wheat quality. Directorate of Wheat Research, Karnal; 1998. p. 1-60.
10. Seadh SE, El-Abady MI, El-Ghamry AM, Farouk S. Influence of micronutrient foliar application and nitrogen fertilization on wheat yield and quality of grain and seed. J Biol Sci. 2009;9(8):851-858.
11. Shi R, Zhang Y, Chen X, Sun Q. Influence of long-term nitrogen fertilization on micronutrient density in grain of winter wheat (*Triticum aestivum* L.). J Cereal Sci. 2010;51(1):165-170.
12. Sramkova Z, Gregova E, Sturdik E. Chemical composition and nutritional quality of wheat grain. Acta Chim Slovaca. 2009;2(1):115-138.
13. Yu LL, Zhou K, Parry JW. Inhibitory effects of wheat bran extracts on human LDL oxidation and free radicals. LWT Food Sci Technol. 2005;38(5):463-470.