

Studies on physico-chemical characteristic of some varieties/genotypes in various *Brassica Species*

Abstract

The present study was conducted in the laboratories of the Department of Agricultural Biochemistry to evaluate thirty-nine varieties/genotypes of Brassica Species for physical and chemical characteristics such as moisture content, Test weight, Oil content, Protein content in meal and Methionine content in meal. The samples were collected from University farm as well after grading of the sample the quality analysis in the laboratory was conducted as per standard procedures. Moisture content in different varieties/genotypes of yellow sarson varied from 5.60 to 3.25 % while toria entries varied from 5.05 to 3.48 %. In case of rai the range of variation was 5.67 to 3.56 %. Test weight in different varieties/genotypes of yellow sarson varied from 5.70 to 3.40 g/1000 seed, while toria entries varied from 5.10 to 3.50 g/1000 seed. In case of rai the range of variation was 4.28 to 3.23 g/1000 seed. Oil content in different varieties/genotypes of yellow sarson varied from 42.55 to 36.20 %, while toria entries varied from 42.05 to 34.40 %. Whereas rai entries recorded variability of 39.05 to 32.40 %. Protein content in different varieties/genotypes of yellow sarson varied from 40.55 to 27.93 %, while toria entries varied from 30.03 to 28.33 %. In case of rai the range of variation was 31.10 to 28.95 %. Methionine content in different varieties/genotypes of yellow sarson varied from 1.98 to 0.99 g/100g, while toria entries varied from 2.12 to 1.14 g/100g. In case of rai the range of variation was 1.84 to 1.22 g/100g.

Keywords: moisture content, Test weight, Oil content, Protein content in meal, Methionine content in meal.

Introduction:

Rapeseed- Mustard is one of the major oilseed crops of India belonging to family Brassicaceae. It is mostly grown in India especially in northern region. Rapeseed-mustard plays an important role in the country among the oilseeds being cultivated. It includes generally Indian mustard (*Brassica juncea*) brown sarson (*Brassica campestris* var. *brown sarson*), yellow sarson (*Brassica campestris* var. *yellow sarson*), toria (*Brassica rapa* var. *toria*), and raya crops. Indian mustard (*B. juncea*) is the predominant crop (about 90%) of rapeseed mustard group of crops in India.

Mustard oil is an important component of the Indian diet. Rapeseed-mustard seed, in general, consist of 35-45 % oil, 27-30 % proteins, 8-10 % fibers, 3-6 % moisture and 10-12 % extractable substances. 1000- seed weight contributed maximum (17.63 %) to genetic divergence followed by days to flower initiation (16.13 %) and siliqua length (12.26 %) (**Kumari and Kumari, 2018**). Among the oilseed Brassica crops, Indian mustard [*Brassica juncea* (L.) Czern and Coss.] is an important source of oil from a nutritional point of view (**Singh et al., 2014**). Rapeseed meals contain less essential amino acids than yellow seeded rapeseed meal Phenylalanine, lysine, threonine, isoleucine, asparagine, glutamic acid, methionine, cysteine, tyrosine, glycine alanine, were significantly higher in yellow seeded meal than in black seeded rapeseed meal (**Jiang et al., 2015**). Studying the biochemical content and protein profile of plants provides useful information for their characterization (Cebeci and Hanci, 2019; Sher et al., 2020; Hanci et al., 2020). The aim of this study was to characterize some Brassica species based on their biochemical contents.

Materials and Methods:

The present research work was carried out during summer season of year **thirty-nine** varieties/genotypes of **Brassica** Species. Some variety of varieties/genotypes of **Brassica Species** grown at Students Instructional Farm of Chandra Shekhar Azad University of Agriculture & Technology, Kanpur (U.P.) Some varieties/genotypes of **Brassica** Specie in CRD design with three replications and after harvesting the grains were processed for **different** quality parameters. One hundred seeds of each variety/genotype were counted; their weight was recorded on electronic balance. It was multiplied by ten to get 1000 seed weight. It was reported in grams. Moisture content is the weight of water in the raw Rapeseed-Mustard in percentage. Moisture content is measured using oven method. The oven is set up at **70°C** then the 39 varieties/genotypes of Rapeseed mustard are weighed and placed inside the oven. Then the final weight of the **sample is** measured after 24 hours. Oil content in seeds was determined by Soxhlet extraction procedure using petroleum ether of boiling point 40-60°C (**AOAC, 1970**). The seeds were dried at 40°C for 8 hours; ground in a pestle & mortar and 2 g sample was weighed in thimble and placed in **Soxhlet** extractor. The oil was extracted with petroleum ether (40-60°C B.P.) for 6 hours. Petroleum ether was **evaporated**, and oil was dried in an oven for one hour at 100-105°C. The oil was cooled and **weighed**, and oil percentage was then calculated.

$$\text{Oil content (\% in seeds)} = \frac{\text{Weight of Extracted Oil (g)}}{\text{Weight of Sample (g)}}$$

Protein estimation by Biuret method **William PC (1961)**. Estimation of methionine was done by **Horn, M. J.; Jones, D. B. and Blum, A. E. (1946)**.

Statistical analysis:

All sample extracts were prepared, and analysis done using a complete randomized design at 5% level of critical difference. Analysis of variance (ANOVA) for the design was carried out to determine the significance of differences among different treatments.

Results and Discussion:

The moisture content varied from significantly within and in between genotypes/entries of yellow sarson, toria and rai. Moisture content in different varieties/genotypes of yellow sarson varied from 5.60 to 3.25 % while toria entries varied from 5.05 to 3.48 %. In case of rai the range of variation was 5.67 to 3.56 %. Among yellow sarson cultivars PITAMBARI (5.60 %) exhibited maximum moisture content followed by YSKM 18-103 (5.30 %). BHAWANI recorded highest moisture content (5.05%) as compared to other toria cultivars TAPESHWARI (4.98 %). TKM 18-104 exhibited maximum moisture content (5.67 %) followed by NDRE-4 (5.63 %) among the rai cultivars. It was observed that the three groups of brassica cultivar (yellow sarson, toria and rai) in sampled variants varied from 5.67 to 3.25 %. The toria variety TKM 18-104 showed the maximum moisture content (5.67 %) followed by variety- NDRE-4 (5.63 %). The minimum moisture content was noted in rai variety- YSKM 18-110(3.25 %). The result obtained was found similar to the value reported by **Chowdhury et al., (2014), Sharif et al., (2017)**.

Test weight in different varieties/genotypes of yellow sarson varied from 5.70 to 3.40 g/1000 seed, while toria entries varied from 5.10 to 3.50 g/1000 seed. In case of rai the range of variation was 4.28 to 3.23 g/1000 seed. Among yellow sarson cultivars YSKM 18-103 (5.70 g) exhibited maximum 1000 seed weight followed by PITAMBARI (5.50 g). KMR(E) 18-102 recorded highest 1000 seed weight (5.10g) as compared to other toria cultivars KMR (E) 18-110 (4.60 g). TKM 18-106 exhibited maximum 1000 seed weight (4.28 g) followed by TKM 18-104 (3.84 g) among the rai cultivars. It was observed that the three groups of brassica cultivar (yellow sarson,

toria and rai) in sampled variants varied from 5.70 to 3.23 g. The yellow sarson variety YSKM 18-103 showed the maximum test weight (5.70 g) followed by variety-PITAMBARI (5.50 g). The minimum test weight was noted in rai variety-KANTI(3.23 g). The yellow sarson variety YSKM 18-103 were significantly superior than other brassica species. These results are in close agreement with the report's of **Chowdhury et al., (2014), Sharif et al., (2017) and Dwivedi and Mishra (2020).**

Table 1. Variability in 1000-seed weight and moisture content Of varieties/genotypes of some *Brassica species*:

S.No.	Brassica species	1000-seed weight (g)	Moisture content
<i>Brassica rapa</i> var. yellow sarson (G1)			
1	YSKM 18-101	3.70	3.60
2	YSKM 18-102	4.50	4.40
3	YSKM 18-103	5.70	5.30
4	YSKM 18-104	3.70	3.70
5	YSKM 18-105	3.80	3.90
6	YSKM 18-106	3.73	4.10
7	YSKM 18-107	3.50	4.60
8	YSKM 18-108	4.30	4.50
9	YSKM 18-109	4.50	4.56
10	YSKM 18-110	3.55	3.25
11	YSKM 18-111	3.69	3.55
12	YSKM 18-112	3.40	3.45
13	YSKM 18-113	4.40	4.04
14	PITAMBARI	5.50	5.60
15	YST-151	4.70	3.57
MEAN		4.18	4.14
<i>Brassica rapa</i> var. toria (G2)			
1	KMR(E) 18-101	3.90	3.54
2	KMR(E) 18-102	5.10	3.48
3	KMR(E) 18-103	4.10	4.10
4	KMR(E) 18-104	3.70	3.94
5	KMR(E) 18-105	3.63	3.63
6	KMR(E) 18-106	3.50	3.50
7	KMR(E) 18-107	4.30	3.73
8	KMR(E) 18-108	3.60	4.26
9	KMR(E) 18-109	4.20	4.52
10	KMR(E) 18-110	4.60	4.63
11	BHAWANI	4.05	5.05
12	TAPESHWARI	4.29	4.98
MEAN		4.08	4.12
<i>Brassica juncea</i> var. rai (G3)			
1	TKM 18-101	3.49	3.97
2	TKM 18-102	3.32	4.32
3	TKM 18-103	3.52	4.44
4	TKM 18-104	3.84	5.67

5	TKM 18-105	3.56	3.56
6	TKM 18-106	4.28	4.42
7	TKM 18-107	3.68	3.68
8	TKM 18-108	3.78	4.63
9	TKM 18-109	3.81	4.25
10	TKM 18-110	3.76	3.76
11	KANTI	3.23	5.23
12	NDRE-4	3.63	5.63
MEAN		3.66	4.46
S.E (diff) Within group		0.082	0.154
C.D. at 5%		0.165	0.307
S.E.(diff.) between G1XG2		0.034	0.184
C.D. at 5%		0.069	0.371
S.E.(diff.) between G1XG3		0.097	0.160
C.D. at 5%		0.195	0.322
S.E.(diff.) between G2XG3		0.101	0.099
C.D. at 5%		0.204	0.201

Oil content in different varieties/genotypes of yellow sarson varied from 42.55 to 36.20 %, while toria entries varied from 42.05 to 34.40 %. Whereas rai entries recorded variability of 39.05 to 32.40 %. Among yellow sarson the entry PITAMBARI recorded highest oil content 42.55 % followed by YSKM 18-108 (42.15 %) while in toria the entry KMR (E) 18-104 recorded maximum oil content (42.05 %) followed by KMR (E) 18-103 (40.83 %). The entry KANTI showed highest oil content of rai cultivars 39.05% followed by TKM 18-103 (38.95 %). It was observed that the three groups of brassica cultivar (yellow sarson, toria and rai) in sampled variants varied from 42.55 to 32.40 %. The yellow sarson variety PITAMBARI showed the maximum oil content (42.55 %) followed by variety- YSKM 18-108 (42.15 %). The minimum oil content was noted in rai variety- TKM 18-101 (32.40 %). The brassica rapa var. yellow sarson variety PITAMBARI were significantly superior than other brassica species. The brassica rapa var. yellow sarson variety PITAMBARI were significantly superior than other brassica species. This result was supported by, **Srivastava and Pathak 1979 and Ahuja *et al.*, 1984.**

Protein content in different genotypes of yellow sarson varied from 40.55 to 27.93 %, while toria entries varied from 30.03 to 28.33 %. In case of rai the range of variation was 31.10 to 28.95 %. Among yellow sarson cultivars YSKM 18-107 (31.55%) exhibited maximum protein content followed by YST-151 (30.02%). KMR (E) 18-101 recorded highest protein content (30.02%) as compared to other toria

cultivars BHAWANI (29.66%). TKM 18-108 exhibited maximum protein content (31.10%) followed by TKM 18-110 (31.02%) among the rai cultivars. It was observed that the three groups of brassica cultivar (yellow sarson, toria and rai) in sampled variants varied from 31.55 to 27.93%. The yellow sarson variety YSKM 18-107 showed the maximum protein content (40.55%) followed by variety- TKM 18-110 (31.02%). The minimum protein content was noted in yellow sarson variety- YSKM 18-101(27.93%). The brassica rapa var. yellow sarson variety YSKM 18-107 were significantly superior than other brassica species. This result was supported by **Chauhan et al., (2011), Singh et al.,(2013), Aletor et al., (2018) and Kumar et al., (2019).**

Methionine content in different genotypes of yellow sarson varied from 1.98 to 0.99 g/100g, while toria entries varied from 2.12 to 1.14 g/100g. In case of rai the range of variation was 1.84 to 1.22 g/100g. Among yellow sarson the entry YSKM 18-108 recorded highest Methionine content 1.98 g/100g followed by YSKM 18-101 1.87 g/100g while in toria the entry KMR (E) 18-107 recorded maximum Methionine content 2.12 g/100g followed by KMR (E) 18-102 1.82 g/100g. The showed highest Methionine content of rai cultivars NDRE-4 1.84 g/100g followed by TKM 18-103 1.67 %. It was observed that the three groups of brassica cultivar (yellow sarson, toria and rai) in sampled variants varied from 2.12 to 0.99 g/100g. The toria variety KMR (E) 18-107 showed the maximum Methionine content (2.12 g/100g) followed by yellow sarson variety- YSKM 18-108 (1.98 g/100g). The minimum Methionine content was noted in yellow sarson variety- YSKM 18-112 (1.98 g/100g). The brassica rapa var. Toria variety KMR (E) 18-107 were significantly superior than other brassica species. Similar observations have been also recorded by **Singh et al., (2013) and Singh et al., (2017).**

Table 2. Variability in oil content, protein content, Methionine and Tryptophan Of varieties/genotypes of some *Brassica species*:

S.No	Brassica species	oil content (%)	Protein content (%)	Methionine content (g/100g protein)
<i>Brassica rapa</i> var. yellow sarson (G1)				
1	YSKM 18-101	41.93	27.93	1.87
2	YSKM 18-102	41.28	28.20	1.49
3	YSKM 18-103	36.20	28.87	1.75
4	YSKM 18-104	38.45	28.45	1.73
5	YSKM 18-105	39.85	29.85	1.79
6	YSKM 18-106	41.52	28.52	1.76

7	YSKM 18-107	40.55	40.55	1.58
8	YSKM 18-108	42.15	27.96	1.98
9	YSKM 18-109	37.70	28.70	1.71
10	YSKM 18-110	41.81	29.81	1.81
11	YSKM 18-111	39.54	29.54	1.50
12	YSKM 18-112	38.45	28.65	0.99
13	YSKM 18-113	36.74	29.74	1.16
14	PITAMBARI	42.55	29.55	1.28
15	YST-151	41.01	30.02	1.34
MEAN		39.98	29.75	1.58
<i>Brassica rapa</i> var. toria (G2)				
1	KMR(E) 18-101	40.35	30.03	1.23
2	KMR(E) 18-102	36.26	29.36	1.82
3	KMR(E) 18-103	40.83	28.83	1.68
4	KMR(E) 18-104	42.05	28.75	1.62
5	KMR(E) 18-105	40.28	29.28	1.56
6	KMR(E) 18-106	35.98	28.98	1.58
7	KMR(E) 18-107	40.50	29.50	2.12
8	KMR(E) 18-108	38.03	28.33	1.71
9	KMR(E) 18-109	34.53	28.57	1.26
10	KMR(E) 18-110	34.40	29.40	1.64
11	BHAWANI	40.66	29.66	1.50
12	TAPESHWARI	39.68	28.68	1.14
MEAN		38.62	29.11	1.57
<i>Brassica juncea</i> var. rai (G3)				
1	TKM 18-101	32.40	29.40	1.48
2	TKM 18-102	34.85	29.85	1.39
3	TKM 18-103	38.95	28.95	1.67
4	TKM 18-104	35.56	30.20	1.49
5	TKM 18-105	37.25	29.95	1.23
6	TKM 18-106	38.50	30.10	1.54
7	TKM 18-107	35.41	30.41	1.36
8	TKM 18-108	34.46	31.10	1.44
9	TKM 18-109	36.62	30.32	1.61
10	TKM 18-110	33.42	31.02	1.22
11	KANTI	39.05	30.75	1.66
12	NDRE-4	38.30	30.40	1.84
MEAN		36.23	30.20	1.49
S.E (diff) Within group		0.031	0.029	0.021
C.D. at 5%		0.061	0.058	0.041
S.E.(diff) between G1XG2				
S.E.(diff) between G1XG2		0.030	0.029	0.020
C.D. at 5%		0.060	0.058	0.041
S.E.(diff) between G1XG3				
S.E.(diff) between G1XG3		0.030	0.029	0.021
C.D. at 5%		0.061	0.059	0.043

S.E.(diff.) between G2XG3	0.032	0.029	0.021
C.D. at 5%	0.064	0.058	0.042

Conclusion:

On the basis of results recorded during investigation of grain quality characteristics of 39 recommended varieties/genotypes brassica species. Moisture content were obtained in Yellow sarson (*Brassica rapa*) varieties/genotypes *Brassica Species*, PITAMBARI, YSKM 18-103 and YSKM 18-107, range from 5.60%, 5.30 % and 4.60 %. The minimum Moisture content was found in variety-YSKM 18-110, 3.25 % . Moisture content were obtained in toria (*Brassica rapa*) varieties/genotypes *Brassica Species*, BHAWANI, TAPESHWARI and KMR(E) 18-110, range from 5.05 %, 4.98 % and 4.63 %. The minimum Moisture content was found in variety-KMR(E) 18-102, 3.48 %. Moisture content were obtained in rai (*Brassica juncea*) varieties/genotypes *Brassica Species*, TKM 18-104, NDRE-4 and KANTI, range from 5.67 %, 5.63 % and 5.23 %. The minimum Moisture content was found in variety-TKM 18-105, 3.56 %. Test Weight were obtained in Yellow sarson (*Brassica rapa*) varieties/genotypes *Brassica Species*, YSKM 18-103, PITAMBARI and YST-151, range from 5.70 gm, 5.50 gm and 4.70 gm. The minimum Test Weight was found in variety-YSKM 18-112, 3.40 gm. Test Weight were obtained in toria (*Brassica rapa*) varieties/genotypes *Brassica Species*, KMR(E) 18-102, KMR(E) 18-110 and KMR(E) 18-107, range from 5.10 gm, 4.60 gm and 4.30 gm. The minimum Test Weight was found in variety-KMR(E) 18-106, 3.50 gm. Test Weight were obtained in rai (*Brassica juncea*) varieties/genotypes *Brassica Species*, TKM 18-106, TKM 18-104 and TKM 18-109, range from 4.28 gm, 3.84 gm and 3.81 gm. The minimum Test Weight was found in variety-KANTI, 323 gm. Oil content were obtained in Yellow sarson (*Brassica rapa*) varieties/genotypes *Brassica Species*, PITAMBARI, YSKM 18-108 and YSKM 18-108, range from 42.55%, 42.15% and 41.93%. The minimum Oil content was found in variety-YSKM 18-103, 36.20%. Oil content were obtained in toria (*Brassica rapa*) varieties/genotypes *Brassica Species*, KMR(E) 18-104, KMR(E) 18-103 and BHAWANI, range from 42.05%, 40.83% and 40.66%. The minimum Oil content was found in variety-KMR(E) 18-110, 34.40%. Oil content were obtained in rai (*Brassica juncea*) varieties/genotypes *Brassica Species*, KANTI, TKM 18-103 and TKM 18-106, range from 39.05%, 38.95% and 38.50%. The minimum Oil content was found

in variety-TKM 18-101, 32.40%. Protein content were obtained in Yellow sarson (*Brassica rapa*) varieties/genotypes *Brassica Species*, YSKM 18-107, YST-151 and YSKM 18-110, range from 31.55%, 30.02% and 29.81%. The minimum Protein content was found in variety-YSKM 18-101, 27.93%. Protein content were obtained in toria (*Brassica rapa*) varieties/genotypes *Brassica Species*, KMR(E) 18-101, BHAWANI and KMR(E) 18-107 range from 30.03%, 29.66% and 29.50%. The minimum Protein content was found in variety-KMR(E) 18-107, 28.33%. Protein content were obtained in rai (*Brassica juncea*) varieties/genotypes *Brassica Species*, TKM 18-103, TKM 18-106 and KANTI range from 31.10%, 31.02% and 30.75%. The minimum Protein content was found in variety-TKM 18-103, 28.95%. Methionine content were obtained in Yellow sarson (*Brassica rapa*) varieties/genotypes *Brassica Species*, YSKM 18-108, YSKM 18-101 and YSKM 18-110, range from 1.98 gm, 1.87 gm and 1.81 gm. The minimum Methionine content was found in variety-YSKM 18-112, 0.99 gm. Methionine content were obtained in toria (*Brassica rapa*) varieties/genotypes *Brassica Species*, KMR(E) 18-107, KMR(E) 18-102 and KMR(E) 18-108 range from 2.12 gm, 1.82 gm and 1.71 gm. The minimum Methionine content was found in variety- TAPESHWARI, 1.14 gm. Methionine content were obtained in rai (*Brassica juncea*) varieties/genotypes *Brassica Species*, NDRE-4, TKM 18-103, TKM 18-106 and KANTI range from 1.84 gm, 1.67 gm and 1.66 gm. The minimum Methionine content was found in variety-TKM 18-110, 1.22 gm.

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