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PROXIMATE COMPOSITION OF OILCAKE AND ASH OF SOME RAPESEED CULTIVARS AVAILABLE IN BANGLADSH

M Rahman[1], K U Ahmed[2], M D Hossain*[3], M Saha[4] and M A Noor[3]

[1]*Investment Corporation of Bangladesh, Head Office, BDBL Bhaban-8, Rajuk Avenue, Dhaka-1000.*
[2]*Department of Biochemistry, Sher-e-Bangla Agricultural University, Dhaka-1207*
[3]*Department of Agribusiness, Atish Dipankar University of Science and Technology (ADUST), Dhaka-1213*
[4]*Department of Agricultural Chemistry, Sylhet Agricultural University, Sylhet-3100, Bangladesh*

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Abstract

The experiment was conducted to investigate the proximate composition of oil cake of *Brassica* cultivars Tori-7, SAU Sharisha-1 and Sampad. Data on different characteristics were recorded to find out the differences for different cultivars of *Brassica campestris*. The highest (8.6%) free sugar was recorded in the cultivar Sampad, while the lowest (7.0%) was recorded in SAU Sharisha-1. The lowest (11.35%) crude fibre of seed was recorded in SAU Sharisha-1. On the other hand, the highest (13.20%) crude fibre was recorded in the cultivar Sampad. The maximum (34.15%) polysaccharide of seeds was recorded in Tori-7 while the minimum (31.00%) was recorded in the cultivar Sampad. The β-carotene content of the released cultivars and lines varied from 174.00 µg to 261.00 µg. The highest (261.00 µg) β-carotene of seed was recorded in SAU Sharisha-1 which was statistically identical (253 µg) with Tori-7, while the lowest (174.00 µg) was recorded in the cultivar Sampad. Total amount of vitamin C concentration in different cultivars of *Brassica* varied from 0.50% to 1.00%. The highest (1.00%) vitamin C of seed was recorded in SAU Sharisha-1. On the other hand, the lowest (0.50%) was recorded in the cultivar Sampad which was closely followed (0.80%) by Tori-7. The highest (43.13%) protein content was recorded in SAU Sharisha-1, while the lowest (34.00%) was recorded in the cultivar Sampad. The highest (6.90%) total nitrogen of seed was recorded in SAU Sharisha-1 and the lowest (5.44%) was recorded in the cultivar Sampad. In respect of ash minerals the highest (0.512%) calcium of *Brassica* seed was recorded in Sampad, while the lowest (0.377%) was recorded in the cultivar SAU Sharisha-1. The highest (0.408%) magnesium of seed was recorded in Sampad and the lowest (0.321%) was recorded in the cultivar Tori-7. The highest (1.65%) potassium of seed was recorded in Sampad, while the lowest (1.50%) was recorded in the cultivar Tori-7 and SAU Sharisha-1. The highest (1.62%) phosphorus of *Brassica* seeds was recorded in Sampad, while the lowest (0.83%) was recorded in the cultivar Tori-7. The highest (0.036%) zinc was recorded in Sampad and the lowest (0.012%) was recorded in the Tori-7. The highest (0.009%) copper was recorded in Sampad, while the lowest (0.001%) was recorded in the cultivar SAU Sharisha-1. The highest (0.210%) manganese was recorded for Sampad, while the lowest (0.016%) was recorded in the cultivar Tori-7. Variety Sampad contain 0.141% iron among the variety that were used in this experiment and the other variety did not contain any amount of iron. Considering all parameters under study, SAU Sharisha-1 performed better than all other cultivars.

***Keywords*:** Brassica, cultivar, variety, polysaccharide and free sugar.

Introduction

Rapeseed is among the major oilseeds in the world, and belongs to the genus '*Brassica*'. It is mainly self-pollinating crop, although on an average 7.5 to 30% out-crossing does occur under natural field conditions (Rakow and Woods,

***Corresponding author: M D Hossain,** Associate Professor and Chairman, Department of Agribusiness, Atish Dipankar University of Science and Technology (ADUST), Dhaka-1213, E-mail: deluaradust@yahoo.com*

1987; Abraham, 1994). Domestic production of edible oil almost entirely comes from rapeseed and mustard occupying only about 2% area of total cropped area in Bangladesh (BBS, 2002). Mustard seed contain about 24 - 40% oil, 17 - 26% protein and 19% hull (Swati *et al.,* 2015). Mustard seeds are processed for oil extraction and the residue obtained is called mustard cake. Mustard cake, about 60% of the seed, is generated as by-product during extraction of the oil (Swati *et al.,* 2015). Mustard oil cake contains high amount of secondary and micronutrients in addition to N, P and K @ 5.1 - 5.2, 1.8 - 1.9 and 1.1 - 1.3%, respectively (BARC, 1997). Among the organic amendments, oil cakes have been found to be the most prospective because they do not only reduce nematode development but also stimulate plant growth supplying plant nutrients of some sorts (Hussain *et al.,* 1989). It also supply sufficient amount of S, Zn and B for the growth. The oil cake obtained after extraction of oil is, therefore, anticipated to increase proportionately. Mustard cake is a rich source of protein, but contains some anti-nutritional factors also. Mustard cake is used as a feed for cattle, poultry and aquatic animal; however, the information on percentage of feed to be given is scanty (Swati *et al.,* 2015). It is also used as a condiment, salad dressing, green manure and fodder crop, and as a leaf and stem vegetable in the various mustard growing countries of the World. Organic fertilizers can play vital role in sustaining soil quality and crop production. Mustard cake is rich in nitrogen (4.8%), phosphorous (2% as P_2O_5) and potassium (1.3% as K_2O) which are essential requirement to maintain fertility of soil and proper growth of plant (Solvent Extractor's Association of India, 2011). They opined, the oil cakes are slow in mineralizing but gaseous nitrogen losses are much smaller in comparison to NO_3 fertilizers. While studying the effect of organic fertilizers including mustard cake, cowdung and poultry manure with inorganic ones. Ullah *et al.* (2008) reported that although organic fertilizers maintained good health of soil but they were slow to release adequate nutrients timely; thus, recommended combined application. Ibrahim and Mumtaz (2014) in their research observed that fungal inoculation with mustard cake increased the plant yield. The composition of mustard cake varies with the variety, growing conditions and processing methods. The crude protein content varies from 33 - 40% of which 80 - 83% is true protein with appreciable proportion of albumin, glutelin and globulin. The protein is rich in lysine and sulphur containing amino acid which are limiting in cereal protein, making it excellent complementary to cereals in completing biological value of protein. Moreover, the composition of amino acids is well balanced for application as protein supplement for human nutrition. Mustard cake contains 21% carbohydrate, 21% lipid, 8.5% crude fibre, and 8% ash (Devi and Devi, 2011). Carbohydrate constitutes mainly soluble sugars (≈10%), cellulose (4 – 5%), pectin (4 – 5%), hemicellulose (3%) and starches (<1%) (Swati *et al.,* 2015). Mustard ash contains minerals like calcium, magnesium, potassium, phosphorus, zinc, copper, manganese and Iron. There are only a few varieties of mustard in our country. To fulfill the requirements of carbohydrate, lipid, crude fibre and minerals we should develop high yielding mustard varieties.

Materials and Methods

The experiment was conducted at the Department of Biochemistry, Sher-e-Bangla Agricultural University, Dhaka and Soil Resource Development Institute, Krishi Khamar Sarak, Dhaka to investigate the chemical constants of oil cake (Free sugar, crude fibre, polysaccharide, β-carotene, vitamin C, protein and total nitrogen) and mineral content of ash (Calcium, magnesium, potassium, phosphorus, zinc, copper, manganese and Iron) of cultivars Tori-7, SAU Sharisha-1 and Sampad *Brassica* species. Young Lin flame Atomic Absorption Spectrophotometer model 8010 was used for the determination of Ca, Mg, Fe, Mn, Zn and Cu while K were determined using Spectrum Lab 22 flame photometer by the method described by (Khan and Zeb,2007) while Phosphorus (P) was determined using titrametric method.

Free sugar

Ground sample of 2.5 g was taken in a conical flask. 20 ml of 80% alcohol was added with the sample and was sonicated for 1 hr. it was then filtered and filtrates was used for total sugars determination. The alcohol was evaporated by using vacuum evaporator. The remaining aqueous solution was carefully transferred to 100 ml volumetric flask and made up to volume. Ten ml. solutions were diluted again to 100 mL with distilled water. One ml dilute solution was taken in a test tube, 4 ml anthrone reagent added and mixed thoroughly. The content in the tube was heated by placing it in a boiling water bath for ten minutes and by placing a marble in the opening of the tube evaporation was restricted. The tube was cooled to room temperature and the intensity of the color developed due to the presence of sugar was measured in spectrophotometer at 620 nm as optical density. A standard curve was prepared from the known concentration of pure glucose and total sugar in the sample was calculated with reference to the standard curve (Rangana, 1978).

Crude fibre

Weighed out 2 g of ground samples and transferred to a special type of beaker (crude fibre beaker). After adding 200 mL of hot 0.225 N Sulphuric acids, the beaker was placed on a preheated plate of the digestion apparatus and digested the sample for 30 minutes rotating the beaker periodically to keep the solids of material from adhering to the sides. Filtered the sample through Whatman no. 42 filter paper placed in Buchner Funnel using a vacuum pump. The residue was washed with hot water until the washing is free from acid (tested with Litmus paper). Transferred the residue (sample) back into the beaker containing 0.313 N hot sodium hydroxide solution placed on the heater. The filter paper was then removed after washing the solution and the sample was then digested for 30 minutes. Filtered the sample through Whatman no. 42 filter paper placed on the Buchner Funnel using the vacuum pump. The sample was washed until the washing was free from alkali (tested with Litmus paper). Finally the residue was washed with alcohol (about 25 mL.). Transferred the residue with filtered paper into a clean crucible and dry the procedure at 100^0 C overweight. The crucible was then transferred into a desiccator and cooled to room temperature and weighted (W_1). The residue was then ignited in a muffle furnace at 600^0C for 30 minutes. Transferred the crucible into a desiccator and cooled to room temperature and weighed it (W_2). A blank was run simultaneously (Kafi, 2002). Weighed of the crude fibres = (W_1-W_2) - blank.

$$\% \text{ Crude fibre} = \frac{(W1-W2)-\text{blank}}{\text{Wt. of the sample (g)}} \times 100$$

Polysaccharide (as starch)

In an Erlenmeyer flask, 1 g of oven dried and desiccated powdered sample was taken and fifty ml of cold water was added. The content of flask was allowed to stand for one hour with an occasional stirring. It was then filtered and the residue was washed with fifty ml of distilled water. The sample was hydrolyzed with 10% HC1 for two and half hours under reflux. The hydrolyzed solution was neutralized with dilute NaOH, solution and filtered. The filtrate was collected in a 100 ml volumetric flask and volume was made to 100 ml.

Fehling's solution 1 and 2 were prepared to equal volumes of those were transferred to a dry flask and mixed thoroughly. Five ml of mixed Fehlingh's solution was taken in a beaker, diluted with 15 to 20 ml water and heated to boiling and added unknown glucose solution from the burette drop by drop until the color of the solution was about to disappear. Two to three drops of methylene blue indicator was added. The titration was continued till the color of the methylene blue just disappeared (Kafi, 2002). The above mentioned procedure was played using the standard glucose solution to calculate glucose percentage and the percentage of starch value was found by the following formula:

$$\% \text{ Starch} = \% \text{ glucose} \times 0.9$$

Determination of β-carotene

β-carotene content of the different cultivars of *Brassica* seed were determined according to the procedure reported in the Methods of Biochemical Analysis (1957).

Determination of vitamin C

Amount of vitamin C present in the different cultivars of *Brassica* seed was determined by the Bessey's titrimetric method.

Estimation of protein and total nitrogen by Microkjeldhal method

The protein content of food stuff was obtained by estimating the nitrogen content of the material and multiplying the nitrogen value by 6.25 (according to the fact that nitrogen constitutes on average 16% of a protein molccule). This is referred to as crude protein content, since the non protein nitrogen (NPN) present in the material was not taken in consideration. The estimation of nitrogen was done by Kjeldhal method (Peter, 1932) which depends upon the fact that organic nitrogen when digested with sulphuric acid in the presence of catalyst selenium oxide, mercury or copper sulfate is converted into ammonium sulphate. Ammonia liberated by making the solution alkaline is distilled into a known volume of a standard acid which was then back titrated. The nitrogen present in the sample was converted to ammonium sulphate by digestion at (380^0C) with sulphate acid in presence of a catalyst, potassium

sulphate and mercuric oxide. Ammonia liberated by distilling the digest with sodium hydroxide solution is absorbed by boric acid and was titrated for quantitative estimation.

Equipments

1. Balance
2. Microkjeldhal (MKj) digestion set
3. MKj distillation set.

Reagents

1. Digestion mixture: 100 g of potassium sulphate (K_2SO_4) was thoroughly mixed with 20 g of copper sulfate ($CuSO_4. 5H_2O$) and 2.5 g selenium dioxide (SeO_2) was added with it.
2. 60% Sodium hydroxide solution: 600 g sodium hydroxide and 50 g sodium thiosulphate were dissolved in distilled water, cooled and made the volume up to 1 liter.
3. Boric acid: 40 g of boric acid was dissolved in water and made up to 1 liter.
4. Double indicator: 200 mg each methyl red and bromocresol green was dissolved separately in 100 ml of 70% ethanol. One part of methyl red and five parts of bromocresol green were mixed before use.
5. Hydrochloric acid (0.02 N HCI): 8.5 ml concentrated hydrochloric acid was added to 5 liter of distilled water. Standardized to 0.02 N acid by titrating it against standard sodium carbonate (0.02 N) solution.

Procedure

A known quantity of the finely rapeseed ground sample (100 mg) weighed out in a MKj digestion flask. About 2 g digestion mixture was added with it 2 ml of concentrated sulphuric acid was dispensed into the flask. Then it was digested for about 2 hrs in MKj digestion set and was cooled the clear digest. The digest was dissolved in minimum amount of distilled water and carefully transferred to a MKj distillation set. 10 ml of sodium hydroxide solution was added and distilled it. The distillate was collected for 5 min into 5 ml boric acid containing 2 drops of mixed indicator in a 50 ml conical flask, till the color of solution was changed. The distillate was titrated against a standard hydrochloric acid and noted the titer value (TV).

$$\text{N (\%)} = \frac{(14.007) \times \text{normality of the acid } (0.02) \times (\text{TV}) \times 100}{\text{Wt.of the sample (mg)}}$$

Where 14.007 is the equivalent weight of nitrogen
Nitrogen % is converted into protein by multiplying with a factor 6.25 for cereals and pulses.

Results and Discussion

Some selected cultivars of *Brassica campestris* were taken for the determination of proximate composition of oil cake. Significant differences were observed among the different components of oil cake in different cultivars of *Brassica campestris*. The results have been presented and discussed, and possible interpretations given under the following headings:

Free sugar

A statistically significant variation was recorded among the cultivars and lines for free sugar of *Brassica* oil seeds. The free sugar contained by different cultivars/varieties of mustard varied from 7.00% to 8.60% (Table 1). The highest (8.60%) free sugar of seed was recorded in Sampad, while the lowest (7.00%) free sugar was recorded in the cultivar SAU Sharisha-1 which was statistically identical (7.40%) with Tori-7. Ahmed (1989) reported 5.2% to 9.1% free sugar in *Brassica* seeds.

Crude fibre

Crude fibre was also determined on the moisture free basis. A statistically significant variation was recorded among the *Brassica* cultivars for crude fibre of seeds. The crude fibre contained by different cultivars of mustard varied from 11.35% to 13.20%. The lowest (11.35%) crude fibre of seed was recorded in SAU Sharisha-1. On the other hand, the highest (13.20%) crude fibre was recorded in the cultivar Sampad which was closely followed (12.05%) by Tori-7 (Table 1).

Polysaccharide

A statistically nonsignificant variation was recorded among the *Brassica* cultivar for polysaccharide content of oil seeds (Table 1). The polysaccharide content of the oil seeds of *Brassica* cultivars varied from 31.00% to 34.15%. The maximum (34.15%) polysaccharide of seeds was recorded in Tori-7 and while the minimum (31.00%) was recorded for Sampad. These results are very similar to that reported for rape seed cakes by Sosulski and Bakal (1969).

β-carotene

β-carotene is a carotinoid pigment that gives rise to vitamin A in animal body, named as provitamin A. One molecule of β-carotene yielded two molecules of vitamin A. β-carotene of different cultivars showed a statistically significant difference among the cultivar. The β-carotene content of the released variety and lines varied from 174.00 µg to 261.00 µg. The highest (261.00 µg) β-carotene of seed was recorded in SAU Sharisha-1 which was statistically identical (253 µg) with Tori-7, while the lowest (174.00 µg) was recorded in the cultivar Sampad. The values obtained in the present studies are close to that found in rape seed (25-500 ppm) by Appelqvist (1971).

Vitamin C

Vitamin C of *Brassica* seeds showed a statistically significant variation among the cultivars that was used under the present trial. Total amount of vitamin C concentration for different cultivars/varieties of *Brassica* varied from 0.50% to 1.00%. The highest (1.00%) vitamin C of seed was recorded for SAU Sharisha-1. On the other hand, the lowest (0.50%) was recorded in the cultivar Sampad which was closely followed (0.80%) by Tori-7. Ahmed (1989) reported 0.5 to 1.0% vitamin C in *Brassica* seeds. The findings of the present study corroborates with the findings of Uddin *et al*. (1995) and Azad and Hamid (2000).

Protein

Protein plays various roles in virtually all biological processes. A statistically significant variation was recorded among the cultivar for protein content (Table 1). The protein content of the *Brassica* seed varied from 34.00% to 43.13%. The highest (43.13%) protein content was recorded in SAU Sharisha-1, while the lowest (34.00%) was recorded in the cultivar Sampad which was closely followed (35.88%) by Tori-7. Findings of the present results suggested that *Brassica* seed cake can be considered as good source of protein. BINA (1981) reported the protein content of *B. campestries* were 18.1 – 22.5%. DGL-Futter Werttable (1997) also reported the crude protein content in soybean and rape meals were 510 and 399, respectively.

Table 1. Composition of Oil Cake of Some Rapeseed Cultivars

Name of the variety	Free sugar (g%)	Crude fibre (g%)	Polysaccharide (g%)	β-carotene (µg%)	Vitamin c (g/%)	Protein (g%)	Total nitrogen (g%)
Tori-7	7.40 b	12.05 b	34.15	253.00 a	0.80 b	35.88 b	5.74 b
SAU Sharisha-1	7.00 a	11.35 c	32.25	261.00 a	1.00 a	43.13 a	6.90 a
Sampad	8.60 a	13.20 a	31.00	37.45 b	0.50 c	34.00 c	5.44 c
$LSD_{(0.05)}$	0.683	0.469	-	2.975	0.089	1.059	0.167
CV (%)	4.46	3.92	4.83	3.78	5.32	4.41	2.41

In a column means having similar letter(s) are statistically similar and those having dissimilar letter(s) differed significantly as per 0.05 level of probability

Total nitrogen

Significant variation was recorded among the *Brassica* cultivar for total nitrogen content. The total nitrogen content of the *Brassica* seed varied from 5.44% to 6.90% (Table 1). The highest (6.90%) total nitrogen of seed was recorded in SAU Sharisha-1 and the lowest (5.44%) was recorded in the cultivar Sampad which was closely followed (5.74%) by Tori-7. Pathak *et al.* (1973) found that nitrogen content 5.76 and 6.03 of oil seeds crop.

Table 2. Proximate mineral composition of Tori-7, SAU Sharisha-1 and Sampad of *Brassica campestris* seeds

Name the variety	Calcium (%)	Magnesium (%)	Potassium (%)	Phosphorus (%)	Zinc (%)	Cupper (%)	Manganese (%)	Iron (%)
Tori-7	0.469 b	0.321 c	1.50 b	0.830 c	0.012 b	0.005 ab	0.016 c	0.000 b
SAU Sharisha-1	0.377 c	0.342 b	1.50 b	1.070 b	0.022 ab	0.001 a	0.190 b	0.000 b
Sampad	0.512 b	0.408 a	1.65 a	1.620 a	0.036 a	0.009 a	0.210 a	0.141 a
$LSD_{(0.05)}$	0.095	0.019	0.126	0.141	0.019	0.006	0.019	0.019
CV(%)	4.84	2.08	4.16	5.19	4.50	3.55	4.73	3.23

Analysis of ash

Calcium

Calcium of *Brassica* oil showed a statistically significant variation among the cultivars. The calcium contained by different cultivars/varieties of mustard varied from 0.377% to 0.512% (Table 2). The highest (0.512%) calcium of *Brassica* seed was recorded in Sampad, while the lowest (0.377%) was recorded in SAU Sharisha-1 which was closely followed (0.469%) with Tori-7 under the present trial. Similar results were also reported in different cultivars of Indian *Brassica* seeds cake (0.45 to 0.82 gm%) and rape seed cake (0.80 gm%) by Pathak *et al*. (1973) and Gjovik (1969).

Magnesium

Magnesium of oil showed a statistically significant difference among the cultivars of mustard. The magnesium contained by different cultivars/varieties of mustard varied from 0.321% to 0.408% (Table 2). The highest (0.408%) magnesium of seed was recorded in Sampad and the lowest (0.321%) was recorded in Tori-7 which was closely followed (0.342%) by SAU Sharisha-1. Pathak (1973) reported 0.25% magnesium for *Brassica* seed.

Potassium

Total amount of potassium of *Brassica* oil showed a statistically significant variation among the cultivar under the present trial. The potassium contained by different cultivars varied from 1.50% to 1.65% (Table 2). The highest (1.65%) potassium was recorded in Sampad, while the lowest (1.50%) was recorded in Tori-7 and SAU Sharisha-1. Pathak (1973) reported 0.93% potassium for *Brassica* seed.

Phosphorus

Phosphorus of *Brassica* showed a statistically significant difference among the cultivar. The phosphorus contained by different cultivars/varieties of mustard varied from 0.830% to 1.620% (Table 2). The highest (1.620%) phosphorus of *Brassica* seeds was recorded in Sampad, while the lowest (0.830%) was recorded in the cultivar

Tori-7 which was closely followed (1.070%) with SAU Sharisha-1. Pathak (1973) reported 049% phosphorus in *Brassica* seed.

In a column means having similar letter(s) are statistically similar and those having dissimilar letter(s) differed significantly as per 0.05 level of probability

Zinc

Zinc of *Brassica* seeds showed a statistically significant variation in different cultivars. The zinc contained by different cultivars of mustard varied from 0.012% to 0.036% (Table 2). Zinc of *Brassica* oil showed a statistically significant variation among the cultivars. The highest (0.036%) zinc of *Brassica* seed was recorded in Sampad and the lowest (0.012%) was recorded in Tori-7. On the other hand, the cultivars SAU Sharisha-1 contain 0.022% zinc which was statistically identical in both the variety Sampad and Tori-7. Pathak (1973) reported 0.032% zinc for *Brassica* seed.

Copper

A statistically significant variation was recorded among the cultivars *Brassica* for copper. The copper contained by different cultivars of mustard varied from 0.005% to 0.009%. The highest (0.009%) copper of *Brassica* seeds was recorded in Sampad, while the lowest (0.001%) was recorded in SAU Sharisha-1 which was closely followed (0.005%) with Tori-7 (Table 2). Pathak (1973) reported 0.004% copper for *Brassica* seed.

Manganese

Manganese of *Brassica* seeds showed a statistically significant variation among the cultivars. The manganese contained by different cultivars/varieties of mustard varied from 0.016% to 0.210% (Table 2). The highest (0.210%) manganese of *Brassica* seeds was recorded in Sampad, while the lowest (0.016%) was recorded in the cultivar Tori-7 which was closely followed (0.190%) with SAU Sharisha-1. Pathak (1973) reported 0.184% manganese for *Brassica* seed.

Iron

Amount of iron of *Brassica* seeds showed statistically significant differences among the mustard cultivar (Table 2). Cultivar Sampad contain 0.141% iron among the variety but the other variety did not contain any amount iron. Similar results also reported earlier by Gjovik (1969).

Conclusion

The seeds were grown under field condition and proximate compositions of oil were determined. Data on different characteristics were recorded to find out the differences for different cultivars of *Brassica campestris*. The highest (8.60%) free sugar of seed was recorded in Sampad, while the lowest (7.00%) free sugar was recorded in SAU Sharisha-1. The lowest (11.35%) crude fibre of seed was recorded in SAU Sharisha-1. On the other hand, the highest (13.20%) crude fibre was recorded in Sampad. The maximum (34.15%) polysaccharide of seeds was recorded in Tori-7 and while the minimum (31.00%) was recorded in the Sampad. The highest (261.00 µg) β-carotene of seed was recorded in SAU Sharisha-1, while the lowest (174.00 µg) was recorded in Sampad. The highest (1.00%) vitamin C of seed was recorded in SAU Sharisha-1. On the other hand, the lowest (0.50%) was recorded in Sampad. The highest (43.13%) protein content was recorded in SAU Sharisha-1, while the lowest (34.00%) was recorded in Sampad. The highest (6.90%) total nitrogen of seed was recorded in SAU Sharisha-1 and the lowest (5.44%) was recorded in Sampad. In respect of ash minerals the highest (0.512%) calcium of *Brassica* seed was recorded in Sampad. The highest (0.408%) magnesium of seed was recorded in Sampad. The highest (1.65%) potassium of seed was recorded in Sampad. The highest (1.62%) phosphorus of *Brassica* seeds was recorded in Sampad. The highest (0.036%) zinc of *Brassica* seed in recorded for Sampad. The highest (0.009%) copper of *Brassica* seeds was recorded in Sampad. The highest (0.210%) manganese of *Brassica* seeds was recorded in Sampad. Cultivar Sampad contain 0.141% iron among the cultivar that were used in this experiment and the other

cultivar did not contain any amount of iron. In conclusion, it was found that SAU Sharisha-1 was better than all other cultivars under studied.

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