

PROXIMATE COMPOSITION OF SEEDS OF HYBRID VARIETIES OF MINOR MILLETS

Sangeeta Gupta¹, S.K. Shrivastava², Manjul Shrivastava³

^{1,2}Department of Applied Chemistry, Jabalpur Engineering College, Jabalpur-482011(M.P.) India

³Department of Chemistry Govt. M.H. College of Home Sciences & Science for Women, Jabalpur (M.P.) India

Abstract

Objective: The aim of present investigation was carried out to study the proximate composition of seeds of hybrid variety of minor millets. **Materials and methods:** The nine hybrid varieties of minor millets viz., *Paspalum scrobiculatum* (variety JK-41, JK-48 & JK-439), *Eleusine coracana* (variety DFM-1 & HR-374), *Panicum sumatrense* (variety JK- 8 & LMCO-2), *Echinochloa frumentacea* (variety BMVL-29 & BMVL-172) were analyzed for their proximate composition by AOAC method. **Results and Conclusion:** The proximate parameter such as moisture, total lipid, crude fibre, crude protein, carbohydrate, total ash, calcium, phosphorus and energy ranged from 10.44-13.97, 1.28-4.87, 3.27-13.59, 9.65-12.25, 72.97-84.88, 2.713-5.425, 0.016-0.34, 0.027-0.95 and 364.6-415.39 g/100g respectively. Nutritionally, minor millets are rich in macro nutrient and micro nutrient (protein, iron, calcium, phosphorus, fibre and vitamin content) which are normally deficient in Indian diets.

Keywords: Minor millets, proximate composition, varieties of *Paspalum scrobiculatum*, *Panicum sumatrense*, *Echinochloa frumentacea*, *Eleusine coracana*.

1. INTRODUCTION

Millets are a group of cereal crops, cultivated around the world in a wide range of soils and climate, for food and fodder. The group includes millets such as little millet (*Panicum sumatrense*), kodo millet (*Paspalum scrobiculatum*), barnyard millet (*Echinochloa frumentacea*) and finger (*Eleusine coracana*) millet[1]. Millets can secure India's food and farming in future because it is amazing in their nutrition contents. Each one of the millets is three to five times nutritionally superior to the widely promoted rice and wheat in terms of proteins, minerals, vitamins and is not an acid forming food so is soothing and easy to digest. In fact, it is considered to be one of the least allergenic.

2. MATERIALS AND METHODS

New hybrid, authentic, healthy and matured seeds of minor millets variety *Paspalum scrobiculatum* (variety JK-41, JK-48 & JK-439), *Panicum sumatrense* (variety JK- 8 & LMCO-2), *Echinochloa frumentacea* (variety BMVL-29 & BMVL-172) and *Eleusine coracana* (variety DFM-1 & HR-374), under investigation were procured from Agriculture Research Station Dindori, regional extension of Jawaharlal Nehru Krishi Vishwavidyalaya, Jabalpur (M.P.).

The seeds of hybrid varieties of minor millets were studied for their proximate composition moisture content, total lipid content, crude fibre content, crude protein, carbohydrate (both reducing and non reducing sugar), calcium, phosphorus,

energy content and other micro nutrients which are also analyzed by solubility behavior of ash characteristics in water and acid. The minor millet seeds were cleaned and stored properly at room temperature prior to their use in actual experiment.

Moisture, Ash (its analysis) and Calcium contents were determined by the method described by Pearson [2, 3]. Crude fibre content was determined by the method as recommended in the Fertilizer and feeding stuff regulations by Pearson [4, 5]. Phosphorus was determined according to the procedure of Sumner[6]. Total lipid was determined by the methods of Colowick and Kaplan[7]. Carbohydrates (reducing and non reducing sugars) were estimated spectrophotometrically according to the procedure of Nelson[8]. Crude protein was estimated by "Micro Kjeldahls" method. Total energy was calculated according to Abulude and Folourunso[9]. The following equation:

$$\text{Energy (Kcal)} = 4 \times (\text{g protein} + \text{g carbohydrate}) + 9 \times (\text{g fat})$$

3. STATISTICAL ANALYSIS

Results of Proximate Analysis of the seeds of *Paspalum scrobiculatum* (variety JK-41, JK-48 & JK-439), *Eleusine coracana* (variety DFM-1 & HR-374), *Panicum sumatrense* (variety JK- 8 & LMCO-2), *Echinochloa frumentacea* (variety BMVL-29 & BMVL-172) were analyzed for statistical report by using Jeffery, G.H. et al. 1989[10]. Descriptive statistics were calculated for triplicate determination and significant

differences within treatments were determined using 5% significance level. The values mentioned in the Table 3.

4. RESULTS AND DISCUSSION

The result of Proximate Analysis of the seeds of *Paspalum scrobiculatum* (variety JK-41, JK-48 & JK-439), *Eleusine coracana* (variety DFM-1 & HR-374), *Panicum sumatrense* (variety JK- 8 & LMCO-2), *Echinochloa frumentacea* (variety BMVL-29 & BMVL-172) are given in Table 1 and 2. Table 3 represents the statistical data with the values of Mean, Standard deviation, Relative standard deviation, Confidence interval and Significance/Nonsignificance.

Moisture content was found to be higher in the *Panicum sumatrense* LMCO-2(13.97 g/100g) and lower in the *Echinochloa frumentacea* variety BMVL-172 (10.44g/100g). Crude fibre content was found to be maximum in *Echinochloa frumentacea* variety BMVL-29(13.59g/100g) and *Eleusine coracana* DFM-1 has minimum (3.27g/100g) which is in resemblance with other varieties of minor millets [11].

Total lipid content was found to be higher in the *Panicum sumatrense* JK-8(4.87 g/100g) and remaining varieties having in the range 1.28 to 3.65g/100g .These values are in close proximity with other varieties of minor millets [12].

Crude protein content was found to be maximum (12.25g/100g) in variety *Eleusine coracana* DFM-1 and minimum in the *Paspalum scrobiculatum* JK-439(9.65g/100g) which are in agreement with other varieties of minor millets [11, 13].

Total carbohydrate content was found to be maximum in *Echinochloa frumentacea* variety BMVL-29 (88.88g/100g) while minimum in the *Paspalum scrobiculatum* JK-439(72.97g/100g) which is higher than the other varieties of minor millets [11, 13, 14].

Energy content was found to be maximum (415.39 Kcal) in *Paspalum scrobiculatum* JK-439 and remaining varieties having in the range 348 to 412.9 kcal which is higher than the other varieties of minor millets [11].

Ash content of *Paspalum scrobiculatum* JK-439 were found to be higher (5.43g/100g) than the other variety of minor millets seed and remaining varieties having in the range 2.713 to 5.43g/100g.

Calcium content of minor millets was found to be maximum in variety of *Eleusine coracana* DFM-1(0.34g/100g) and minimum in *Panicum sumatrense* LMCO-172.The value of Phosphorous content ranged from 0.027-0.95 g/100g. These results are in good agreement with other varieties of minor millet seeds [11, 13].

Table 3 shows the statistical report of minor millets indicating significant results with respect to all parameter of proximate analysis.

5. CONCLUSIONS

Minor millets are nutritious, healthy and versatile and hence would be a worthy addition to one's diet. From the above mentioned composite data the high carbohydrate, crude fibre, protein, and mineral content provide a good source of substitute diet to combat protein calorie malnutrition. Calcium deficiency, leading to bone and teeth disorder, iron deficiency leading to anemia, can be overcome by introducing minor millets in our daily diet because minor millets has the highest calcium among all cereal. Thus diet with the regular inclusion of minor millet can contribute much to health promotion and disease prevention.

REFERENCES

- [1]. Ravindra U., Vijakumari J., Sharan S., Raghuprasad K.P. and Kavaloor R., *Tropical Agric Research*, vol. 20, pp.115–122, 2008.
- [2]. Pearson D., *The chemical analysis of food*. 5th Ed., London,pp. 18,1962.
- [3]. Pearson D., *The chemical analysis of food*. 5th Ed., London, pp.30, 1962*.
- [4]. Pearson D., *Laboratory Technique in Food Analysis*,pp. 48-49,1973.
- [5]. Pearson D., *Laboratory Techniques in Food Analysis*, London, Butter Worths, pp. 54-55,1973.
- [6]. Sumner J.B., *Journal of Biological Science*,vol. 100, pp. 413,1944.
- [7]. Colowick S.P. and Kaplan N.O., *Academic Press Inc.*, New York, pp. 85, 1957.
- [8]. Nelson N.J., *Journal of Biological Chemistry*, vol.153, pp. 375, 1944.
- [9]. Abulude F.O. and Folourunso R.O., "Preliminary studies on millipede: Proximate composition, nutritionally valuable minerals and phytate contents". *Global Journal of Agriculture Science*, vol. 2, No.2, pp. 68-71,2003.
- [10]. Jeffery G.H. Bassett J Mendham J and Denny RC:*Vogel's quantitative chemical analysis*, 5th edition, longman scientific and technical, Co. John wiley and son. US, New York, pp.127-149,1989.
- [11]. Hulse J.H., Laing E.M. and Pearson O.E., "Sorghum and the Millets: Their Composition and Nutritive Value", *Academic Press*, New York,pp. 997,1980.
- [12]. Sridhar R and Lakshminarayana G: Content of total lipids and lipid classes and composition of fatty acids in small millets: foxtail (*Setariaitalica*), proso (*Panicum miliaceum*), and finger (*Eleusine coracana*). *Cereal Chem.*, Vol. 71, No.4, pp. 355- 358,1994.
- [13]. Amadou Issoufou, Gounga Mahamadou E. and Guo-Wei Le, "Millets Nutritional composition, some health benefits and processing-A (Review)". *Emir. J. Food Agric*.Vol.25,No. 7 pp.501-508,2013.

[14]. Wankhede D.B., Shehnaj A. and Raghavendra Rao MR: Plant Foods Hum. Nut., vol.28, pp.293-303,1979. Carbohydrates composition of finger millet (*Setaria italica*).

Table 1 Proximate Principles of Air Dried Seeds of Minor Millet Varieties (g/100g)

| Name of the varieties | Moisture | Total Lipid | Crude Fibre | Crude Protein | Total Carbohydrates | Reducing Sugar | Non-reducing Sugar | Energy Kcal |
|---|----------|-------------|-------------|---------------|---------------------|----------------|--------------------|-------------|
| <i>Paspalum scrobiculatum</i> JK-41 | 12.04 | 3.12 | 8.57 | 9.83 | 74.3 | 5.3 | 69.0 | 364.6 |
| <i>Paspalum scrobiculatum</i> JK-48 | 12.43 | 3.46 | 7.75 | 10.2 | 73.66 | 4.0 | 69.66 | 366.58 |
| <i>Paspalum scrobiculatum</i> JK-439 | 12.62 | 3.87 | 8.872 | 9.65 | 72.97 | 4.8 | 68.17 | 365.31 |
| <i>Panicum sumatrense</i> variety JK-8 | 13.30 | 4.87 | 7.53 | 11.91 | 80.98 | 3.82 | 77.16 | 415.39 |
| <i>Panicum sumatrense</i> variety LMCO-2, | 13.97 | 4.65 | 7.6 | 11.45 | 81.09 | 3.68 | 77.41 | 412.01 |
| <i>Echinochloa frumentacea</i> variety BMVL-29 | 11.71 | 2.56 | 13.59 | 11.87 | 84.88 | 2.98 | 81.9 | 410.04 |
| <i>Echinochloa frumentacea</i> variety BMVL-172 | 10.44 | 3.58 | 13.31 | 12.01 | 83.16 | 2.87 | 80.29 | 412.9 |
| <i>Eleusine coracana</i> DFM-1 | 12.58 | 1.46 | 3.27 | 12.25 | 78.25 | 7.61 | 70.64 | 375 |
| <i>Eleusine coracana</i> HR - 374 | 11.89 | 1.28 | 3.58 | 11.66 | 79.11 | 2.92 | 76.19 | 348 |

* The values in the table represent the mean of triplicate

Table 2 Mineral and Ash Content of Air Dried Seeds of Minor millets Varieties (g/100g)

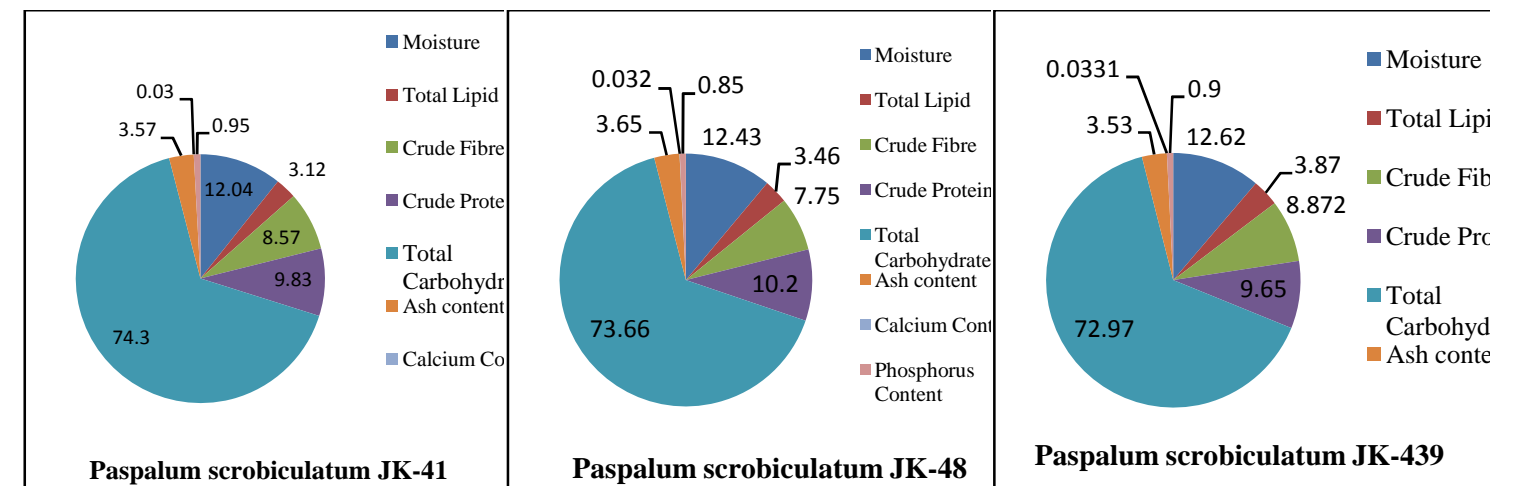
| Name of the sample | Ash content | Wt. of water soluble ash | Wt. of water insoluble ash | Alkalinity of water soluble ash (m eq) | Wt. of acid soluble ash | Wt. of acid insoluble ash | Calcium Content | Phosphorus Content |
|--|-------------|--------------------------|----------------------------|---|-------------------------|---------------------------|-----------------|--------------------|
| Paspalum scrobiculatum JK-41 | 3.57 | 2.66 | 0.92 | 14.12 | 3.49 | 0.081 | 0.03 | 0.95 |
| Paspalum scrobiculatum JK-48 | 3.65 | 2.75 | 0.90 | 13.78 | 3.57 | 0.31 | 0.032 | 0.85 |
| Paspalum scrobiculatum JK-439 | 3.53 | 2.53 | 1.02 | 13.64 | 3.43 | 0.097 | 0.0331 | 0.90 |
| Panicum sumatrense variety JK-8 | 5.43 | 4.45 | 0.98 | 15.71 | 5.33 | 0.092 | 0.018 | 0.45 |
| Panicum sumatrense variety LMCO-2 | 5.23 | 4.25 | 1.02 | 14.88 | 4.36 | 0.864 | 0.016 | 0.39 |
| Echinochloa frumentacea variety BMVL-29 | 3.03 | 2.17 | 0.86 | 12.75 | 2.94 | 0.094 | 0.02 | 0.027 |
| Echinochloa frumentacea variety BMVL-172 | 2.93 | 2.05 | 0.88 | 11.75 | 2.79 | 0.137 | 0.02189 | 0.028 |
| Eleusine coracanaDFM-1 | 2.713 | 2.14 | 0.573 | 11.46 | 2.64 | 0.069 | 0.34 | 0.285 |
| Eleusine coracana HR-374 | 2.72 | 1.99 | 0.727 | 10.73 | 0.07 | 0.072 | 0.0335 | 0.290 |

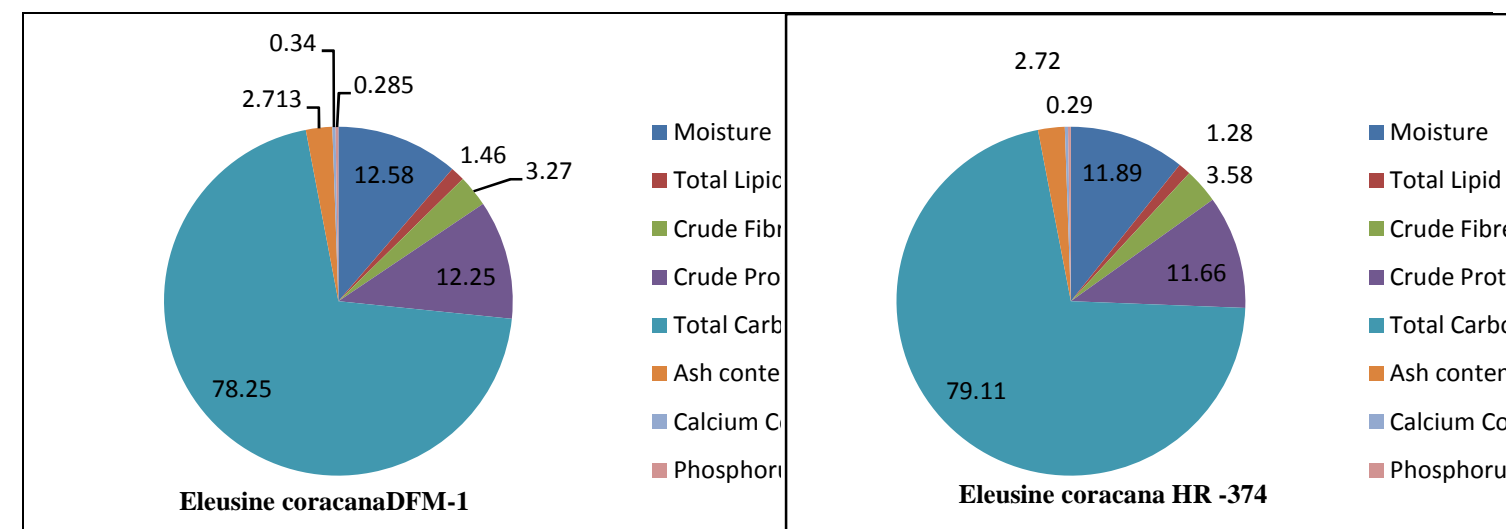
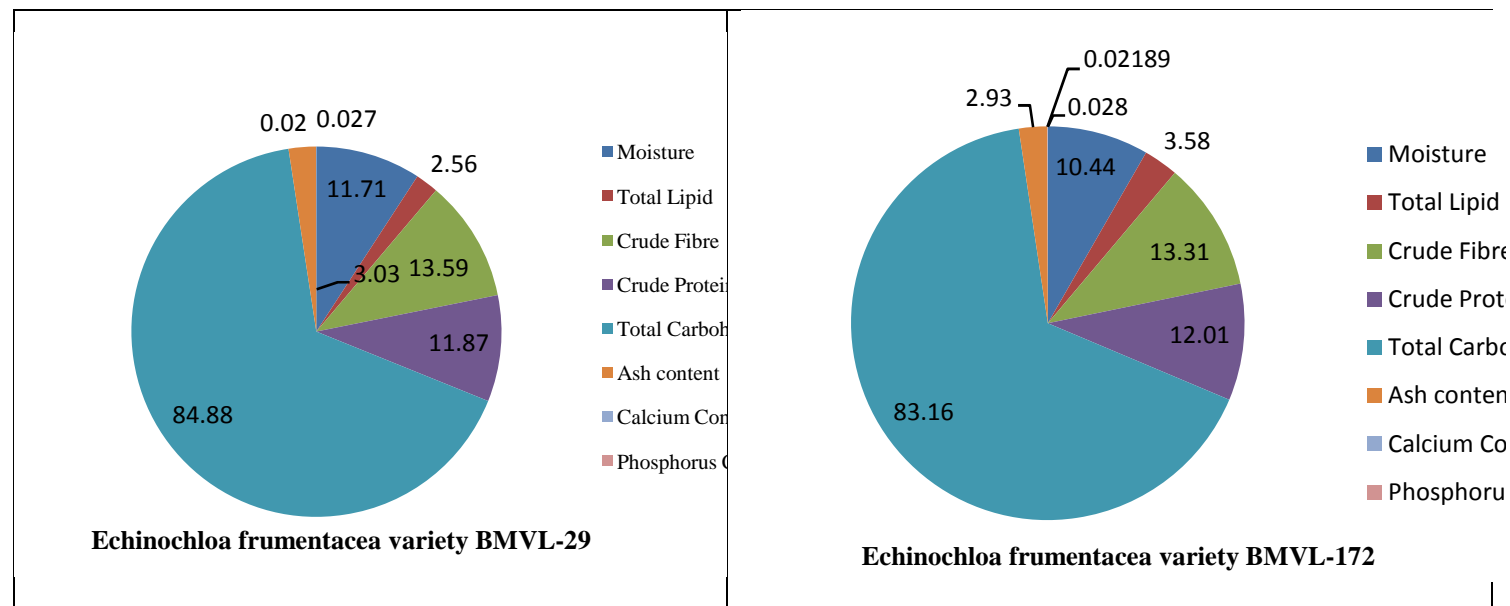
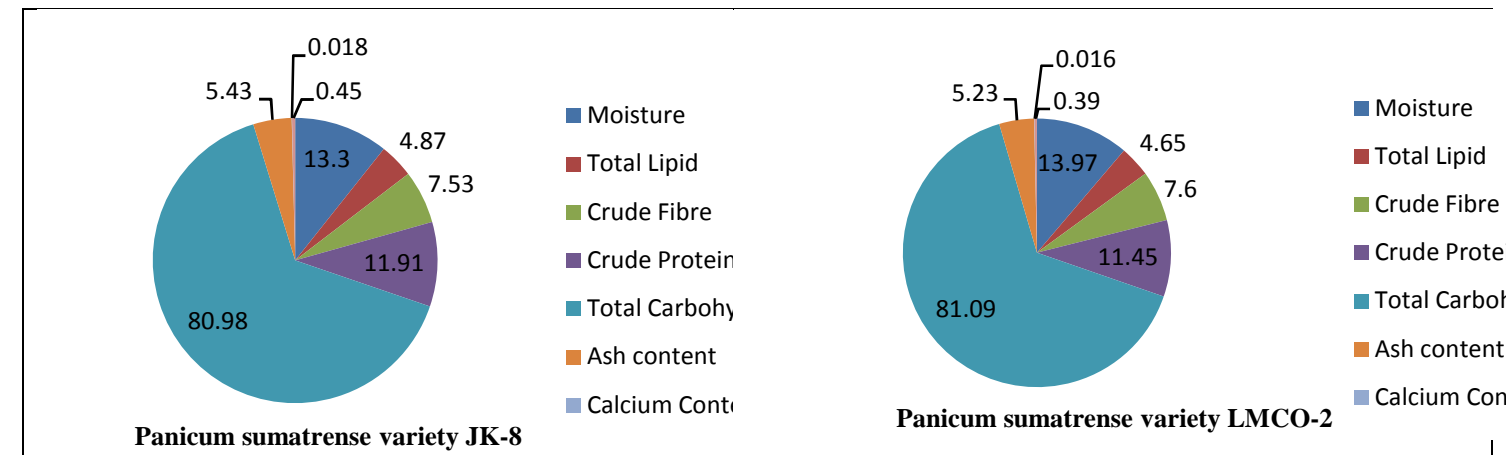
* The values in the table represent the mean of triplicate

Table 3 Statistical Data of Proximate Composition of Seeds of Minor Millets

| PROPERTIES | THE STATISTICAL DATA OF SEED SAMPLES OF NINE VARIETIES OF SELECTED SEEDS OF MINOR MILLETS | | | | | | |
|---------------------------------------|---|--------------------|-----------------------------|--------------------------------------|------------------|---|------------------------------------|
| | MEAN | STANDARD DEVIATION | RELATIVE STANDARD DEVIATION | ONE WAY ANALYSIS OF VARIANCE (ANOVA) | | | Significant / Non significant (NS) |
| | | | | F(5%,8,18) CALCULATED | F(5%,8,18) TABLE | CD % CONFIDENCE LEVEL (t 5% X ERROR df) | |
| Moisture | 12.33 | 0.965 | 0.0783 | 443.672 | 2.51 | 0.117 | Significant |
| Total lipids | 3.206 | 1.209 | 0.377 | 47557.58 | 2.51 | 0.0142 | Significant |
| Crude fibre | 8.232 | 3.457 | 0.419 | 218.52 | 2.51 | 0.594 | Significant |
| Crude Protein | 11.203 | 0.977 | 0.087 | 2606.951 | 2.51 | 0.049 | Significant |
| Total Carbohydrates | 78.71 | 4.117 | 0.0523 | 55109.4 | 2.51 | 0.0416 | Significant |
| Reducing Sugars | 4.22 | 1.489 | 0.353 | 60.743 | 2.51 | 0.479 | Significant |
| Non Reducing Sugars | 74.49 | 4.984 | 0.067 | 67914.45 | 2.51 | 0.049 | Significant |
| Energy K/Cal | 388.51 | 22.265 | 0.0573 | 700482.9 | 2.51 | 0.0679 | Significant |
| Ash content | 3.645 | 0.981 | 0.269 | 428.185 | 2.51 | 0.121 | Significant |
| Water soluble ash | 2.78 | 0.9004 | 0.324 | 250.49 | 2.51 | 0.145 | Significant |
| Water insoluble ash | 0.876 | 0.144 | 0.164 | 40.805 | 2.51 | 0.558 | Significant |
| Acid insoluble ash | 0.202 | 0.272 | 1.345 | 12.090 | 2.51 | 0.183 | Significant |
| Alkalinity of water soluble ash (meq) | 13.203 | 1.6198 | 0.123 | 61.07 | 2.51 | 0.519 | Significant |
| Calcium | 0.094 | 0.133 | 1.413 | 288.26 | 2.51 | 0.0203 | Significant |
| Phosphorus | 0.4633 | 0.344 | 0.742 | 5733.235 | 2.51 | 0.0116 | Significant |

The values mentioned in the table are obtained by the application of (ANOVA) One way analysis of variance. (Jeffery, G.H. *et al.* 1989).





BIOGRAPHIES

Mrs. Sangeeta Gupta, M.Sc. She is currently a Ph.D scholar in the Department of Applied Chemistry affiliated to Rani Durgawati Vishwavidyalaya, Jabalpur (India) 482011 under the guidance of Dr. S.K.Shrivastava and Dr. Manjul Shrivastava. Her research includes natural product. She has six publications in her credit.

Dr. S. K. Shrivastava, M.Sc, Ph.D. He is Professor and Head of the Department of Applied Chemistry, Jabalpur Engineering College Jabalpur, (India) 482011. His research includes natural product. He has 81 publications in his credit. He has guided 16 Ph.D. students.

Dr. Manjul Shrivastava, M.Sc, Ph.D, She is Professor and Head of the Department of Chemistry Govt. M.H. College of Home Science &, Science for Women Jabalpur (M.P.) India 482002. Her research includes natural product. She has 26 publications in her credit. She has guided 7 Ph.D. students.