

To study the effect of the developed drinking powder on the blood profile of athletes (16-17 Years)

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ABSTRACT

Instant drinking powders are much relevant to the Indian sports scenario because of the fact that many of the Indian athletes are undernourished and anaemic. Cereal/millet based drinking powder as supplement was developed. The formulated drinking powder was organoleptically evaluated by a panel of judges and athletes by using nine-point hedonic scale. The panels gave the highest overall acceptability scores to the sample VI level which was prepared by using 25g soybean powder, 20g germinated wheat powder, 10g germinated green gram dal powder, 10g germinated pearl millet powder, 5g germinated finger millet powder, 5g cocoa powder and 25g fine sugar powder per 100g. The most acceptable level was chemically analyzed. Sixty athletes in the age group of 16 to 17 years were selected from Sonipat district, Haryana. The athletes were divided into two groups as ESG (experimental study group) and CSG (control study group). Experimental study group supplemented with carbohydrate, protein, calcium and iron rich (100g) choko germinated multigrain drinking powder with 200ml milk for 8 weeks, whereas the control study group did not received any supplementation. The blood profile *i.e.* fasting blood glucose, blood urea and total serum cholesterol of experimental study group were significantly ($P < 0.01$) changed from 79.83mg/dl to 88.15mg/dl, 23.91mg/dl to 29.37mg/dl, 144.05mg/dl to 153.78 mg/dl and the haemoglobin level improved from 9.72 ± 1.40 g/dl to 11.23 ± 1.30 g/dl, which was resulted to eight weeks supplementation of choko germinated multi grain drinking powder. The minimum increment in blood profile of selected athletes from control group was statistically significant at 5% level.

Key Words : Choko germinated multigrain dinking powder, Athletes, fasting blood glucose, blood urea, total serum cholesterol and haemoglobin

INTRODUCTION

The poor standing of Indian sports in comparison to leading nations like the United States of America and China implies that stamina level is not up to the mark to compete with the participants of developed countries. The vicious cycle of low achievement in sports by Indian athletes could be attributed to the genetic makeup; cereal based vegetarian food habits and poor physique. Other reasons may be poor socio-economic back ground, costly food, inadequate quality and quantity of food and nutrient intake. India is yet to win medals equal to its population which could never be done, if nutrition is ignored. In countries such as India where malnutrition is of public health dimension,

poor athletic performance could be partly due to poor physique and unsatisfactory physical fitness resulting from undernourishment (Tripathy, 1985). Nutritious food is an important key of physical fitness and good health, which plays an important role in attaining a high level of achievement in sport and athletes, besides other factors like motivation, skill, techniques, commitment and training. Glucose is the major carbohydrate present in blood. Its oxidation in the cells is the source of energy for the body. Cholesterol is the main lipid found in blood, bile and brain tissues. Decrease levels are found in mal-absorption, malnutrition, hyperthyroidism and anaemia and liver diseases. Urea is the final result of the metabolism of proteins; it is formed in the liver from their destruction. It can be appearing elevate in the blood (Uraemia) it means the diets with excess of proteins. Early fatigue during exercise is a common complaint among athletes, especially female athletes. Fatigue may be caused due to overtraining, stress, less stamina and other external factors also but many cases attributable to a lack of iron in the blood, a condition known as anaemia (Kimberly and Mueller, 2006). Germination is a common household technique carried out at low cost without the use of any sophisticated and expensive equipment. It reduces anti-nutrients thereby improving nutritional and functional properties of pearl millet and also the mousy odour of damp millet is eliminated. It was observed that decrease in the anti-nutritional factors of cereal grains was a result of soaking and germination (Gupta and Sehgal, 1991). Several studies have shown that germination improves the nutritive value of cereals and legumes (Marero *et al.*, 1989a; Marero *et al.*, 1989b; Hansen *et al.*, 1989). A multigrain snack helps in high intake of fibre and health enhancing components (Ragae and Abddel Aal, 2006). Use of grains or a combination of one or two grains, legumes, and oilseeds is a recent trend in the baking industry as it gives multiple health benefits apart from improved taste, aroma, appearance and variety (Indrani *et al.*, 2010).

Objectives :

Keeping in view the beneficial effect of underutilized germinated grains/legumes/millet the present study was planned to study the effect of developed food supplement on blood profile *i.e.* fasting blood glucose, blood urea, total serum cholesterol and haemoglobin level of athletes.

METHODOLOGY

Development and sensory evaluation of food supplements:

Energy, protein, calcium and iron rich food supplements were developed for enhancing the sports potential of athletes. Based on the information received during dietary survey, cereal/millet based six type drinking powder as supplements were developed by using processing method like soaking, germinating, drying, roasting and grinding. All constituents were prepared separately. Soybeans were only roasted without germination. To improve the palatability and appearance cocoa powder was added to resemble chocolate milk powders. Fine sugar powder added in the above mix made the product was dense of calorie. The organoleptic evaluation of developed drinking powder was done by the panel of judges using the 9-Hedonic Rating Scale.

Chemical analysis of developed drinking powder:

Choko germinated multigrain drinking powder most acceptable and selected for feeding trial was chemically analysed for proximate composition such as moisture, crude protein, and crude fat, crude fiber by using the method of AOAC (2007). Calcium and iron were determined by AOAC (2007). Carbohydrate was calculated by differential method. The calorie value was calculated by

sum of the percentages of proteins and carbohydrates multiplied by a factor of 4 (kcal/g) and total lipids multiplied by a factor of 9 (kcal/g). Shelf life of the food supplement was assessed through total bacterial count by pour plate (Dhawale and La Master, 2003), method in comparison with the initial.

Selection and feeding of the subjects:

The subjects (boys and girls) include students in the age of 16 to 17 years were selected from schools of Sonapat district of Haryana state. General information pertaining to age, education qualification and place of stay. They represented their concerned school in different sports/games. The selected athletes were divided in two groups as experimental study group (30) and control study group (30). Diet of experimental study group was supplemented by 100 g drinking powder daily with 200ml of milk (50g twice a day) for 8 weeks to improve their nutritional status, whereas the control study group did not received any supplementation. The feeding trial was monitored by the research scholar with help of coach and PTI of the school.

Blood profile of the selected subjects:

Blood analysis was done for fasting blood glucose (GOD/POD METHOD), haemoglobin (Dacie and Lewis, 1975), total serum cholesterol CHOD-PAP method (modified method of Roeschlau *et al.*, 1974), blood urea GLDH- Urease method (Take and Schubert, 1965; Tiffany *et al.*, 1972) by Auto Blood Analyzer.

Statistical analysis :

The data on the selected parameters were analyzed statistically.

RESULTS AND DISCUSSION

General information about the athletes of experimental and control study groups are presented in Table 1. The sixty subjects were categorized into two groups *i.e.* experimental study group (ESG) and control study group (CSG). Out of 60 athletes, thirty athletes were part of the ESG (Experimental Study Group) and another thirty athletes were participated as a CSG (Control Study Group). Nineteen boy and eleven girls were in experimental study group and same as 19 boys and 11 girls were part of the control study group. Table 1 revealed that nineteen boys athlete of experimental study group were studying in 10th class (3), 11th class (9), 12th class (7) and regarding education of girls athletes 10th class (2), 11th class (6), 12th class (3), respectively. Further regarding educational qualification of both boys and girls athletes of control study group (CSG), 19 athlete boys were studying in 10th class (2), 11th class (12) and 12th class (5) same as 11 girls athletes were studying as 10th class (1), 11th class (8) and 12th class (2), respectively. The subjects were divided into two age groups *i.e.* 16 years and 17 years. Eleven boys' athletes of ESG belonged to age group of 16 years and 8 in age group of 17 years. Out of 11 girls of ESG, 5 girls athletes age group of 16 years and 6 in age group of 17 years. Regarding athletes of control study group (CSG) 7 boys belonged to 16 years and 12 boys were belong to 17 years of age group, while 4 girls were age group of 16 years and 7 girls to 17 years age group, respectively. Nineteen boys and 11 girls of ESG were residing in home, whereas nineteen boys of control study group were residing in home and 11 girls in hostel.

Six types of food supplements were developed in form of nutritious drinking powder namely

choko germinated wheat powder, choko germinated pearl millet powder, choko germinated finger millet powder, choko germinated green gram dal powder, choko soybean powder and choko germinated multi grain powder. All food supplements evaluated for color, appearance, aroma, texture, taste, overall acceptability characterised by a panel of ten judges using 9 point hedonic scale.

| Table 1 : General information about experimental and control study groups | | | | | | | | |
|---|----------------|-------|----------------|-------|----------------|-------|----------------|-------|
| General information | ESG* (n=30) | | | | CSG* (n=30) | | | |
| | No of subjects | | Percentage | | No of subjects | | Percentage | |
| Boys | 19 | | 63.66 | | 19 | | 63.66 | |
| Girls | 11 | | 36.66 | | 11 | | 36.66 | |
| Educational qualification | Boys n=19 | | Girls n=11 | | Boys n=19 | | Girls n=11 | |
| | No of subjects | % |
| 10 th | 3 | 15.78 | 2 | 18.18 | 2 | 10.52 | 1 | 9.09 |
| 11 th | 9 | 47.36 | 6 | 54.54 | 12 | 63.15 | 8 | 72.72 |
| 12 th | 7 | 36.84 | 3 | 27.27 | 5 | 26.31 | 2 | 18.18 |
| Age group | | | | | | | | |
| 16yrs | 11 | 57.89 | 5 | 45.45 | 7 | 36.84 | 4 | 36.36 |
| 17yrs | 8 | 42.10 | 6 | 54.54 | 12 | 63.15 | 7 | 63.63 |
| Place of stay | | | | | | | | |
| Home | 19 | 100 | 11 | 100 | 19 | 100 | | |
| Hostel | | | | | | | 11 | 100 |

(ESG) *Experimental study group

(CSG) *Control study group

Values indicate percentage of athletes

Table 2 showing the overall acceptability mean scores of all food supplements samples were as sample I (7.14), sample II (7.42), sample III (8.1), sample IV (7.94), sample V (8.26) and sample VI (8.44). The highest score 8.44 was obtained by sample VI. Sample VI was most liked by judges due to roasted multigrain flavour with cocoa and sweet taste, so that's why sample VI (choko germinated multi grain drinking powder) was selected for feeding trial. Hundred grams developed choko germinated multigrain drinking powder was analyzed for proximate composition showed that it had 22.18 g of crude protein, 10.77 g of crude fat, 2.93 g of crude fibre, 1.99 g of ash, 76.23 g of carbohydrates and provided 489.57 Kcal of energy. Carbohydrate is the major fuel for exercise at workloads above 50 per cent of VO_2 max utilized aerobically. Several studies points out that carbohydrates could be easily oxidized for energy production and as such are the sources of 'instant energy' for athletic activities especially glucose (Jentjen and Jeukendrup, 2003 and Williams, 2006). The concentration of minerals calcium and iron in developed choko germinated multigrain drinking was 288.77 mg and 9.19 mg, respectively. For the evaluation of supplementation study, the blood profile *i.e.* fasting blood glucose, blood urea, total serum cholesterol and haemoglobin of experimental and control study groups of athletes were assessed before and after the intervention. All the increased mean values of biochemical tests were within normal reference values. At the end of 8 weeks with supplements Table 3 revealed that the mean value of fasting blood glucose of athletes in experimental study group was 79.83 ± 5.57 mg/dl before supplementation, which was improved to 88.15 ± 5.75 mg/dl after supplementation with choko germinated multi grain drinking powder. FBG mean of experimental study group athletes was increased significantly at $P < 0.01$ (14.76) whereas the mean FBG 86.88 ± 10.22 mg/dl of athletes from control study group was improved

Table 2: Organoleptic score of developed food supplements

| Sample code | Food supplements | Color | Appearance | Aroma | Texture | Taste | Over-all acceptability |
|-------------|------------------|-----------|------------|-----------|-----------|------------|------------------------|
| I | CGWP | 7.4±0.8 | 7.3±0.674 | 6.3±1.059 | 7.6±0.699 | 7.1±1.100 | 7.14±0.502 |
| II | CGPMP | 8±0.942 | 7.5±0.527 | 7.2±1.032 | 7.2±0.788 | 7.2±0.632 | 7.42±0.349 |
| III | CGFMP | 8.1±0.538 | 8.1±0.737 | 8±0.942 | 8.1±0.567 | 8.2±0.918 | 8.1±0.070 |
| IV | CGGGDP | 8.4±0.516 | 7.9±0.316 | 7.7±0.483 | 7.8±0.632 | 7.9±0.0875 | 7.94±0.270 |
| V | CSP | 8.1±0.994 | 8.2±0.632 | 8.2±0.632 | 8.3±0.483 | 8.5±0.707 | 8.26±0.151 |
| VI | CGMGP | 8.5±0.707 | 8.4±0.843 | 8.4±0.699 | 8.6±0.516 | 8.3±0.823 | 8.44±0.114 |

Values are mean ± SD

CGWP : Choko germinated wheat powder

CGPMP : Choko germinated pearl millet powder

CGFMP : Choko germinated finger millet

CGGGDP: Choko germinated green gram dal powder

CSP : Choko soybean powder

CGMGP : Choko germinated multi grain powder

to 87.27±9.96 significant at 5% level, respectively. Lindsay *et al.* (2015) reviewed the intermittent sports (e.g., team sports) are diverse in their rules and regulations but similar in the pattern of play; that is, intermittent high-intensity movements and the execution of specific sports skills over a prolonged period of time (1–2 h). Performance during intermittent sports is dependent upon a combination of anaerobic and aerobic energy systems, both of which rely on muscle glycogen and/or blood glucose as an important substrate for energy production. Singh and Kochhar (2012) studied on thirty sportswomen in the age group of 16 to 18 years and observed that the mean glucose level of the subjects before the supplementation was 120.6 mg/dl. The corresponding values before and after the supplementation period were 121.4 and 139 mg/dl, respectively. The mean blood urea tested in athletes of experimental study group athletes was 23.91±5.41mg/dl before supplementation while after the end of supplementation programme it was 29.37±5.32mg/dl significantly increase at P<0.01 (18.07), whereas pre-supplementation tested blood urea mean value of control study group was 27.80±6.27mg/dl, which was 28.08±6.27mg/dl, significantly changed at P<0.05 (2.44), respectively. According to Zachwieja (2012), protein is important for active body because it provides amino acids that our muscles need to continually rebuild themselves. Without fuel to rebuild athletes will be taking the training in the wrong direction and risking an injury to their muscles.

It was observed that the serum cholesterol level of experimental study group athletes increased from 144.05±13.71mg/dl to 153.78±13.10 which was increased at P<0.01 (11.93), respectively. Other side mean serum cholesterol level of control study group changed from 142.27±22.51 to 142.58±22.43 which was significant P<0.05 (2.17). Zalcman *et al.* (2007) reported that in their study of twenty-four adventure race athletes (18 men and 6 women), 24 to 42 y of age, participated in the study. High blood levels of total cholesterol and low-density lipoprotein cholesterol were found in female athletes (201.0 ±44.7 and 104.1 ± 43.1 mg/2007dL, respectively). The mean value of haemoglobin of experimental study group was 9.72±1.40g/dl before supplementation which was improved to 11.23±1.30g/dl after supplementation with choko germinated multi grain drinking powder. Haemoglobin mean value was increased significantly at P<0.01(14.70) whereas the mean haemoglobin 9.80±1.25g/dl of athletes of control study group was improved to 9.88±1.36g/dl which was non-significant (1.29) increase in haemoglobin of athletes respectively. Singh and Kochhar (2012) studied on thirty sportswomen and observed the mean haemoglobin (Hb) of the subjects before and after the control period was 10.73 and 10.77 g/dl and after the three months of

| Table 3 : Effect of supplementation study on blood profile of selected groups of athletes (16-17years) | | | | | | |
|---|----------------------------------|--------------|----------|----------------------------|--------------|--------------------|
| Blood parameters | Experimental study group (n= 30) | | | Control study group (n=30) | | |
| | Before | After | 't' test | Before | After | 't' test |
| Fasting blood glucose 70-110mg/dl | 79.83±5.57 | 88.15±5.75 | 14.76** | 86.88±10.22 | 87.27±9.96 | 1.98* |
| Blood Urea 13-45mg/dl | 23.91±5.41 | 29.37±5.32 | 18.07** | 27.80±6.27 | 28.08±6.27 | 2.44* |
| S. Cholesterol 140-250mg/dl | 144.05±13.71 | 153.78±13.10 | 11.93** | 142.27±22.51 | 142.58±22.43 | 2.17* |
| Haemoglobin M:13g/dl, F: 12g/dl | 9.72±1.40 | 11.23±1.30 | 14.70** | 9.80±1.25 | 9.88±1.36 | 1.29 ^{NS} |

Values are Mean ± SD

^{NS}Non-significant

* Values Significant at P < 0.05 (1.96)

** Values Significant at P < 0.01(2.58)

experimental period the corresponding value was 11.89 g/dl.

Conclusion :

The investigation of the present study revealed that supplementation of 100 g developed choko germinated multigrain drinking powder with 200 ml milk helped in improving the fasting blood glucose, blood urea, total serum cholesterol and haemoglobin level in subjects. This was reflected by significant ($p < 0.01$) increase in fasting blood glucose (79.83 mg/dl to 88.15mg/dl), blood urea (23.91 mg/dl to 29.37mg/dl), total serum cholesterol (144.05 mg/dl to 153.78 mg) and mean Hb level (9.72 g/dl to 11.23g/dl), respectively. Hence it can be inferred from the results that supplementation of developed food supplement significantly rapid improved the blood profile of the athletes as compared to control study group's athletes.

REFERENCES

- AOAC (2007). Official Methods of Analysis. 18th Edition, Association of Official Analytical Chemists, Gaithersburg
- Dacie, V. and Lewis, S.M. (1975). Practical Haematology, 8th edition. Churchill: Livingstone.
- Dhawale, S. and LaMaster, A. (2003). Microbiology Laboratory manual. The mcHill Company.Inc. USA.
- Gupta, C. and Sehgal, S. (1991). Development, acceptability and nutritional value of weaning mixture. *Plant Foods Hum. Nutr.*, **41**: 107-116.
- Hansen, M., Pederdorn, B., Hunk, L. and Eggum, B.O. (1989). Weaninf foods with improved energy and nutrient density prepared from germinated cereals. I PrerARATION of dietary bulk of gruels Based on barley. *Food Nut. Bull.*, **11** : 40-44.
- Indrani, D., Soumya, C., Jyotsna, R. and Venkateshwara, R.G. (2010). Multigrain bread—Its dough rheology, micro- structure, quality and nutritional characteristics. *J. Texture Studies*, **41** : 302-319. <http://dx.doi.org/10.1111/j.1745-4603.2010.00230>.
- Jentjens, R. and Jeukendrup, A.(2003). Determinants of post-exercise glycogen synthesis during short-term recovery. *Sports Med.*, **33** : 117–144.
- Kimberly, J. and Mueller (2006). “When fatigue slows you down – iron deficiency anaemia”, Active.com.
- Lindsay, B. Baker, Ian Rollo, Kimberly, W. Stein and Asker E. Jeukendrup (2015). Acute effects of carbohydrate

- Supplementation on Intermittent Sports Performance. *Nutrients*, **7** : 5733-5763; doi: 10.3390/nu7075249.
- Marero, L.M., Payumo, E.M., Aguinaldo, A.R. and Hmma, S. (1989b). Nutritional characteristics of weaning food prepared from germinated cereals and legumes. *J. Food Sci.*, **53** :1399-1402.
- Marero, L.M., Payumo, E.M., Librando, E.C., Lainez, W. , Gopez, M.D. and Homma, S.(1989a). Technology of weaning food formulations prepared from germinated cereals and legumes. *J. Food Sci.*, **53** :1391-1395.
- Ragae, S. and Abddel Aal, E.S.M. (2006). Pasting properties of starch and protein in selected cereals and quality of their food products. *Food Chem.*, **95**(1):9–18. doi: 10.1016/j.foodchem.2004.12.012.
- Roeschlau, P., Bernt, E. and Gruber, W.A. (1974). Enzymatic determination of total cholesterol in serum. *Clin. Chem. Clin. Biochem.*, **12** : 226.
- Singh, A. and Kochhar, A. (2012). Study on the efficacy of supplementation of functional beverage on the blood profile of Sportswomen. *Internat. J. Scientific & Res. Publications*, **2** (2) February 2012, ISSN 2250-3153
- Take, H. and Schubert, G.E. (1965). The enzymatic determination of urea using greiner G300. *Klin. Wochschr.*
- Tiffany, T.O., Jansen, J., Burtis, C.A., Overton, J.B. and Scott, C.D. (1972). Enzymatic kinetic rate and end-point analyses of substrate, by use of a GeMSAEC fast analyzer. *Clin. Chem.*, **18**:829.
- Tripathy, S. (1985), “Nutritional status and knowledge of sportsmen, scope for nutrition education”, A Dissertation to the NIN as a partial fulfilment for the Degree of Master of Science.
- Williams, M. (2006), “Nutrition for Health, Fitness and Sport”, 5th ed. New York, NY: McGraw-Hill; 2006.
- Zachwieja, J. (2012). ‘Why Protein Is Important for Athletes’ <http://www.stack.com/a/protein>
- Zalcman, I., Guarita, H.V., Juzwiak, C.R., Crispim, C.A., Antunes, H.K., Edwards, B., Tufik, S. and de Mello, M.T. (2007). Nutritional status of adventure racers. *Nutri.*, **23**(5) : 404-411. Epub 2007 Mar 26.
