

To study the effect of the developed choko germinated multigrain drinking powder on the physical health and sport performance of selected young athletes (16-17years)

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Abstract

The present study was undertaken to study the effect of the formulated Choko germinated multigrain drinking powder (CGMGDP) on the physical health and sport performance of selected young athletes (16-17years) of Sonapat District, Haryana, India. Athletes were divided in two groups as ESG (experimental study group) and CSG (control study group). Both the groups were assessed for nutrients intake, anthropometric measurements, blood profile and sports performance parameters. Experimental group supplemented with carbohydrate, protein, calcium and iron rich (100g) choko germinated multigrain drinking powder with 200ml milk for 8 weeks. The supplementation resulted weight increase from 46.11kg to 47.13kg of experimental group significant at 1% level, whereas pre supplementation recorded mean 17.80kg/m² BMI of experimental study group was changed 18.23kg/m² at the end of feeding trial, which was significant increase at 1% while in the control group marginal increase BMI was not statistically significant. Significantly improvement ($p < 0.01$) was found in blood profile i.e. fasting blood glucose, blood urea, total cholesterol and haemoglobin after the intervention session of 8 weeks. The sports performance parameters was measured by easy and costless components like endurance and agility was measured by using 100 meter race and 6 × 10 M shuttle run while power and strength was measured by high jump and speed and strength was measured by long jump, respectively. Performances of 100 meter race and 6 × 10 M shuttle run were significantly ($P < 0.01$) improved by decreased time from 20.57second to 18.02 second and 13.44 second 10.65 second of the experimental study group of athletes. The performance of high and long jump sports were significantly ($P < 0.01$) improved by covered the more distance in meter by athletes. From the research finding it is evident that the positive impact of Choko germinated multigrain drinking powder supplementation on the all selected parameters including sports performance of athletes.

Key Words: Choko germinated multigrain dinking powder, athletes, physical health, 100mt race, long jump, high jump and 6 × 10 M shuttle run

INTRODUCTION

Nutrition requirements of junior athletes are different as compared to non-athlete and adult because of the growth spurt and increase physical activity in them. In particular, their daily dietary requirements are totally different from a non-athlete. They require more energy and more protein (2g per kg of body weight) to take care of development of muscle mass, muscle regeneration and the additional requirements due to sports activities. Such athletes with poor nutritional status fail to build sound endurance capacity resulting in reduced levels of physical performance. Sports nutritionist Shiny Chandran (2015) has expressed that there is a dire need for customization of diet and nutrition for Indian athletes and mindful eating is doubly important for those who actively participate in sports. Athletes expend their calories more than the non-athletes and hence need extra calories in their diet. Carbohydrates are the master fuel for athletes to make the brain active. Carbohydrate feedings before or during exercise spares the limited muscle glycogen stores and prevents fatigue. In order to have sustained aerobic performance, carbohydrate replacement and carbohydrate loading are essential. Gradually decreasing the amount of training and simultaneously increasing the amount of carbohydrates during the last 6 to 7 days before a game or competition will result in higher physical performance. Protein produces antibodies to fight against infections, helps to gain lean body mass and aids to achieve optimal health status and performance. It is helpful for muscle repair and strength. It prevents athletic related injuries and useful to maintain positive nitrogen balance. The protein in muscle and liver

is broken down into amino acids during exercise. This will be utilized as an energy source either directly or indirectly. Ingesting carbohydrates before or during exercise spares protein and limits the breakdown of protein. Protein intake of 1.2 to 2.0g/kg/day is needed for athletes (ACSM, 2000, Phillips, 2006). The primary minerals low in the diets of athletes especially female athletes are calcium, iron, zinc and magnesium (Whiting and Barabash, 2006). Inadequate dietary calcium and vitamin D increase the risk of low bone mineral density and stress fractures (Duppe et al., 1996). One of the consequences of anaemia is impaired work performance, as the decreased haemoglobin (Hb) level reduces the oxygen carrying capacity of the blood for the working muscles (Volpe, 2006 and Agarwal, 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 (Ragaei and Abddel Aal 2006). Millet grains, before consumption and for preparing of food, are usually processed by commonly used traditional processing techniques include decorticating, malting, fermentation, roasting, flaking, and grinding to improve their edible, nutritional, and sensory properties. However, negative changes in these properties during processing are not avoidable because industrial methods for processing of millets are not as well developed as the methods used for processing of wheat and rice (FAO 2012). Therefore, with value-added strategies and appropriate processing technologies, the millet grains can find a place in the preparation of several value-added and health food-products,

which may then result in high demand from large urban populations and non-traditional millet users (Mal and others 2010).

Objectives

On the International level, sports and athletics receive tremendous attention today. India is making rapid records in the field of sports and Indian athletes are endeavouring to reach the top position in national and international arena. Their performance is often obstructed by lack of stamina and poor health due to nutritional deficiencies and disorders. Limited researches are available on junior athlete, sports nutrition and its evaluation on sports performance. Keeping in view the beneficial impact of underutilized millets/grains/cereals the present study was planned to study the effect of the developed Choko germinated multigrain drinking powder (CGMGDP) on the physical health and sport performance of selected young athletes (16-17years).

MATERIAL AND METHODS

1. Development and sensory evaluation of food supplement:

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/millets 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.

2. 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.

3. 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. They represented their concerned school in different sports and 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 100gm 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 researcher with help of coach and PTI of the school.

4. D. Assessment of Physical Characteristics

- *Anthropometric measurements and blood profile*

The subjects were measured for their standing height by using a vertical measuring rod and body weight by weighing scale. All the measurements were carried out as per guidelines of Jelliffe and Jelliffe (1966). Body Mass Index (BMI) is a simple computation derived from weight in kilograms and height in meters using the formula weight (kg)/height (m²). WHR was measured of using a stretch-resistant tape by method described by (WHO 2008b). Blood analysis was done for fasting blood glucose (GOD/POD METHOD), Haemoglobin (Dacie and Lewis, 1975), Total 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.

- **Performance parameters**

Health, nutrition and fitness are interrelated which recognized to athletic performance defined by Sports-related fitness involves skills that are necessary for sports performance. These skills are sport-specific neuromuscular motor skills such as agility, timing and accuracy, balance, speed, strength, power, and endurance recommended in Nutrition and hydration guidelines for excellence sport performance (ILSI-India, 2005). Sports performance of athletes was measured by these components which are cost effective and easy to carry out. Investigator was chosen four component from these i.e., agility, endurance, power and strength, speed and strength. Endurance was measured using 100 meter race. Agility was measured using 6 × 10 M shuttle run. Power and strength was measured by High jump. Speed and strength was measured by long jump. High jump, Long jump were performed on the sandy soil of sports ground of school (NPFP, 2012). All the sports events were performed with the help of coaches before and after supplementation study.

5. E. Assessment of Nutrient intake

Nutrient intake was computed for all the subjects to assess their nutritional status, using 24 hours dietary recall method and compared with Suggested Dietary Allowances (Handbook of Sports Nutrition) of Junior sports person before and after the inclusion of drinking powder.

Statistical analysis The data on the selected parameters were analyzed statistically.

RESULT AND DISCUSSION

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. Arya (1996) reported the color has an important role to play in product evaluation. The highest mean score for color was obtained by sample VI (8.5), whereas sample I got the lowest score of 7.4 and the highest score for appearance which pleases to sense of vision was obtained by sample VI of 8.4, respectively. The lowest appearance mean score was obtained by sample I of 7.3. The regarding acceptability highest mean scores for aroma was 8.4 obtained by sample VI and lowest score again gain by sample I (6.3), respectively. Again the sample VI was obtained in highest texture score of 8.6, whereas sample II was obtained lowest score of 7.2, respectively. The mean score of taste of Sample V was obtained highest 8.5 and lowest score for sample I was 7.1, respectively. Table 1 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 (Cocoa germinated multi grain powder) was selected for feeding trial.

Table 1 Organoleptic score of developed food supplements

Sample code	Food supplements	Color	Appearance	Aroma	Texture	Taste	Overall 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

Physical Characteristics of selected group of young athletes (16-17 years)

It is evident from the Table 2 (Anthropometric measurements of athletes) were recorded to study

the impact of supplementation. Mean height and waist hip ratio of both genders and groups was same before and after the intervention. But the supplementation resulted weight increase from 46.11kg to 47.13kg of experimental group significant at 1% level, whereas increased weight was observed non-significant in control study group. The pre supplementation recorded mean 17.80kg/m² BMI of experimental study group was changed 18.23kg/m² at the end of feeding trial, which was significant increase at 1% while in the control group marginal increase BMI was not statistically significant.

Table 2 Effect of supplementation study on anthropometric measurement of selected groups of athletes

Anthropometric measurement:-	Experimental study group (n= 30)			Control study group (n=30)		
	Before	After	't' test	Before	After	't' test
Weight(cm)	46.11±6.57	47.13±6.51	10.0* *	45.79±4.98	45.91±5.00	1.55 ^{NS}
Height(kg)	160.73±8.25	160.73±8.25	-	161.06±7.09	161.06±7.09	-
BMI kg/m ²	17.80±1.75	18.23±1.84	8.70* *	17.71±1.24	17.74±1.22	1.71 ^{NS}
Waist-hip-ratio	0.74±0.05	0.74 ±0.05	-	0.76±0.05	0.76 ±0.05	-

Values are Mean ± SD *Values Significant at P < 0.05 (1.96)

^{NS} Non-significant ** Values Significant at P < 0.01(2.58)

Table 3 revealed that the blood profile i.e. fasting blood glucose, blood urea and s. 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 Hb level improved from 9.72±1.40g/dl to 11.23±1.30g/dl, which was

resulted to eight weeks supplementation of Choko germinated multi grain drinking powder. The minimum increments in blood profile of selected athletes from control group were statistically significant at 5% level, while the haemoglobin was non-significant at 5%, respectively.

Table 3 Effect of supplementation study on blood profile of selected groups of athletes

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 * Values Significant at $P < 0.05$ (1.96)

^{NS} Non-significant ** Values Significant at $P < 0.01$ (2.58)

Physical performance of selected group of young athletes (16-17years)

Performances of 100 meter race and 6 × 10 M shuttle run were significantly ($P < 0.01$) improved by decreased time from 20.57second to 18.02 second and 13.44 second 10.65 second of the experimental study group of athletes. The

performance of high and long jump sports were significantly ($P < 0.01$) improved by covered the more distance in meter by athletes. The recorded mean value of high jump and long jump before supplementation were 0.92mt and 2.63mt of experimental study group, which was improved to 1.15mt and 2.81mt after the supplementation respectively. Whereas minor changes in sports (the 100 meter race, high jump, long jump and 6 ×

10 M shuttle run) performed by athletes from control study group were observed non-significant (Table 4).

Table 4 Effect of supplementation on sports performance parameters of selected groups of athletes

Performance parameters	Experimental study group (n= 30)			Control study group (n=30)		
	Before	After	't' test	Before	After	't' test
100 meter race Endurance,(sec.)	20.57±2.84	18.02±2.45	10.72 **	20.32±2.66	20.29±2.63	0.84 ^{NS}
High jump Power and strength(m)	0.92±0.17	1.15±0.15	11.04 **	0.98±0.35	0.99±0.35	1.72 ^{NS}
Long jump Speed and strength (m)	2.63 ±0.63	2.81±0.63	7.82 **	2.42±0.58	2.45±0.59	1.68 ^{NS}
6 ×10M shuttle run Agility (sec.)	13.44±1.83	10.65±1.59	15.02**	13.41±1.86	13.40±1.83	0.19 ^{NS}

Values are Mean ± SD * Values Significant at P < 0.0 5 (1.96)

^{NS} Non-significant ** Values Significant at P < 0.01(2.58)

Impact on daily mean nutrients intake of athletes

The mean actual energy intake by athletes of both groups were 2654.98kcal and 2367.09kcal before intervention period but after intervention session increased 3144.55kcal mean actual was observed by athletes of experimental group whereas little changes was 2377.19kcal found in mean intake by control group. This is clear that the energy supplied by choko germinated multi grain powder (100g) amounted to 489.57kcal so that the total energy intake of experimental group was enhanced. The mean protein actual intake by athletes of experimental study group was 94.71g/day before supplementation which was improved to 126.89 g/day after the supplementation because of the protein content of choko germinated multi grain powder was

22.18g and this increased to the total protein intake of experimental group. Whereas the mean protein intake 92.55g/day by athletes of control study group was improved to 93.01g which was less increase as compared to experimental study group, respectively. The drastically changed in protein intake of experimental study group was due to eight weeks supplementation of CGMG drinking powder. Table 5 also revealed that the daily mean intake of fat and carbohydrate by experimental study group were 82.76g and 298.54g before supplementation while after the end of supplementation programme these were increased 93.53g and 375.77g respectively. Pre-supplementation recorded mean daily mean intake of fat and carbohydrate by control study group was 80.45g and 311.35g but post-

supplementation session which was 80.85g and 317.16g with miner increased.

The experimental study group of 30 athletes was supplemented with Choko germinated multi grain powder for eight weeks. It was observed that the minerals intake of calcium and iron by experimental study group increased from 823.16mg/day to 1111.93mg/day and increased 17.46mg/day to 26.65mg/day, Other side daily mean intake of calcium and iron of control study group changed from 734.87mg/day to 612.23mg/day and 16.34mg/day to 15.21mg/

day, which was decreased mean values of calcium and iron intake. The addition of Choko germinated multigrain drinking in the daily diet of the experimental study group, the all nutrients namely energy, protein, fat, carbohydrate, iron and calcium were improved. The daily energy intake of experimental group 2654.98 kcal was improved 3144.55Kcal; 94.71g protein increased to 126.89g, 82.76g fat intake improved by 93.53g and the consumption of calcium (823.16mg) and iron (17.46mg) was also improved by 1111.93mg and 26.65mg, respectively.

Table 5 Impact on daily mean nutrients intake of selected group of athletes due to inclusion of Choko germinated multi grain drinking powder

Nutrients	Experimental study group (n=30)			Control study group (n=30)	
	Before	+CGMGDP *	After	Before	After
Energy(kcal)	2654.98±242.25	489.57	3144.55±312.70	2367.09±283.96	2377.19±151.08
Protein(g)	94.71±76.05	22.18	126.89±55.34	92.55±52.33	93.01±6.01
fat(g)	82.76 ±19.16	10.77	93.53±10.55	80.45±16.56	80.85±11.25
Carbohydrate(g)	298.54±77.12	76.23	375.77±81.24	311.35± 114.09	317.16±9.80
Calcium(mg)	823.16±169.01	288.77	1111.93±163.14	734.87± 161.90	612.23±35.3
Iron(mg)	17.46± 5.98	9.19	26.65± 4.09	16.34± 5.65	15.21±3.11

Values are in mean ±SD

* CGMGDP : Choko Germinated Multi Grain Drinking Powder

CONCLUSION

The investigation of the present study revealed that the addition of Choko germinated multigrain drinking in the daily diet of the experimental study group, the all nutrients namely energy, protein, fat, carbohydrate, iron and calcium were improved. The impact of supplementation resulted the all selected physical parameters of experimental group were significantly improved at 1% level. Fasting

blood glucose, blood urea and s. 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 Hb level improved from 9.72±1.40g/dl to 11.23±1.30g/dl, which was resulted to eight weeks supplementation of Choko germinated multi grain drinking powder. The positive impact of supplementation of Choko germinated multigrain drinking powder on the sports potential of athletes was seen.

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