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Supplementation strategy for enhancing sports potential of selected athletes of Sonipat district, Haryana

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Abstract
Nutrition as a hammer, which is a strong tool to enhancing sports performance of junior athletes. An adequate nutrition coupled with scientific training alone can give the winning edge to athletes. The intervention strategy was used to enhance the sport performance of selected junior athletes of Sonipat, Haryana. Athletes were divided in two groups as experimental and control study group. The data of athletes on anthropometric measurements, sports performance parameters and dietary details were recorded using a pre-designed and pre-tested performa. The data were analyzed statistically. Diet of experimental study group was supplemented with carbohydrate, protein; calcium and iron rich (100g) choko flavored germinated multigrain drinking powder with milk for 8 weeks. The intervention resulted that the sports 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 to 10.65 second. High and long jump were also significantly (P<0.01) improved by athletes.

Keywords: Supplementation, athletes, sports potential, food supplement

Introduction
Sports Nutrition has many goals to enhance performance. First, it improves performance by improving body composition, which increases speed, quickness, mobility, and strength. Second, it will help the speed of recovery, which will in turn create more capacity for practice and competition as the body is becoming more fit and adjusted to the coupling of the good nutrition incorporated into the workout regimen. 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 major variation in the energy needs of different individuals of the same age, sex and bodyweight is due to difference in physical activity (Applegate and Grivetti, 1997) [1]. Conference of ILSI-India, (2005) [8] defined the maintaining adequate energy levels, weight loss and weight gain can have profound impact on sports performance. Coaches, athletes, and sports scientists are all interested in the energy requirements of athletes and significant contribution has been made not only in identifying nutritional needs, especially energy, during the sports season but also during the active recovery phase, especially in the developed countries. Understanding sports nutrition leads to optimal athletic performance and lifetime health benefits (AMA, 1991) [2]. Energy and macronutrient needs, especially carbohydrate and protein, must be met during times of high physical activity to maintain body weight, replenish glycogen stores, and provide adequate protein to build and repair tissue (Brown, 2002). Athlete's nutritional status can be assessed by the ABCDE method that is generally being used for population studies. Anthropometrics includes measurements such as weight and height. Biochemical analysis includes blood and urine tests. The dietary requirements of young athletes are different from adults' athlete and non-athlete adolescents because they need 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.
They use relatively more fat as a fuel during exercise and energy cost of walking and running is higher in young athletes. Supplements are popular worldwide. They are required for their ability to increase physical power and mental strength of the athletes.

Supplements delay the fatigue during prolonged exercise; improve strength, stamina, agility, speed, endurance and aid rapid recovery from injuries. Demands of the dietary supplements are increasing on a greater scale in developing countries like the Brazil, Russia, India and China (Devla *et al*., 2011) [6]. 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) [7]. According to Williams, (2006) [13] and Ryley, (1988) [12] nutrition provides both fuel for biologic work and the chemicals for extracting and utilizing the potential energy contained within the cells. Supplementary food based strategy play a vital role in preventing macro and micronutrient deficiencies.

Objective

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. Ours athletes 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 objective was planned to Intervention strategy for enhancing sports potential of selected junior athletes.

Material and Methods

Development and sensory evaluation of food supplements

Energy, protein, calcium and iron rich six drinking powders were developed by using processing methods like soaking, germinating, drying, roasting and grinding. All constituents were prepared separately. Soybeans were only roasted without germination. For improving the palatability and appearance cocoa powder was added to resemble chocolate milk powders. The organoleptic evaluation of developed drinking powder was done by the panel of judges using the 9-Hedonic Rating Scale.

Nutritional assessment

The nutritional status of athletes was assessed by anthropometric measurement like height (cm), weight (Kg), body mass index ((kg/m^2) and waist hip ratio (W÷ H) using standardized procedure. Biochemical analysis was done for fasting blood glucose, haemoglobin, total cholesterol and blood urea.

Selection of the subjects

The subjects (boys and girls) include students in the age of 16 to 17 years were selected from GSS school and Campus schools of BPSM University, Khanpur Kalan, Sonipat district of Haryana state. 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 100gm drinking powder daily (50g twice a day) with 200ml of milk for 8 weeks to improve their nutritional status, whereas the control study group did not receive any supplementation. The feeding trial was monitored by the research scholar with the help of coach and PTI of the school.

Nutrient assessment

Nutrient intake was computed for all the subjects to assess their nutritional status, using 24 hours dietary recall method and compared with Suggested Daily Allowance (SDA) for junior sports persons, (SAI schemes 2002-2003 from Handbook of Sports Nutrition by Lal P.R.)

Performance parameters

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) [11]. All the sports events were performed with the help of coaches before and after supplementation study.

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

Result and Discussion

Information about subject*:*

The data about information of athletes like gender and age of both groups are presented in Table-1. The sixty subjects were categorized into two groups i.e. experimental and control study group.

Table 1: 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	
Age group								
16yrs	11(B)	57.89	5(G)	45.45	7(B)	36.84	4(G)	36.36
17yrs	8 (B)	42.10	6(G)	54.54	12(B)	63.15	7 (G)	63.63

ESG*Experimental study group

CSG*Control study group, (B) for Boys and (G) for Girls

Nineteen boys and eleven girls were in experimental study group and same as 19 boys and 11 girls were part of the control study group. 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 17years. Out of 11girls of ESG, 5 girls athletes to 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 belonged to 17 years of age group, while 4 girls were belonged to 16 years and 7girls to 17 years of age group, respectively

Developed food supplements: Arya (1996) [3] reported that the color has an important role to play in product evaluation The highest mean score for color was obtained by sample VI (8.5) and sample I got the lowest 7.4 score. The color of all developed food supplements was liked by the judges and scores were more than the minimum acceptability score of five. Average highest 8.4 score for appearance which pleases to sense of vision was obtained by sample VI. The lowest 7.3 mean score was obtained by sample I for appearance. The appearance of six food supplements was acceptable which were high than minimum acceptability score point 5.

Figure1. Indicates the regarding acceptability mean scores for aroma the highest score 8.4 out of 5 was obtained by sample VI and the score 6.3 for aroma was observed to be the lowest for again sample I. Again the sample VI was obtained the highest score 8.6 for texture whereas sample II was obtained 7.2 lowest score, respectively. The mean score of taste of Sample V was obtained highest 8.5 whereas lowest score 7.1 was obtained by sample I, respectively. All the food supplements taste scores ranged from 7.1 to 8.5, which were moderate and like very much organoleptic score (7 and 8) due to different taste of grains, cocoa powder and fine sugar.

Figure1 also shows the 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. Food supplement sample VI was most liked by judges due to roasted multigrain flavor with cocoa and sweet taste, so that's why sample VI (Choko flavored germinated multi grain drinking powder) was selected for feeding trial.

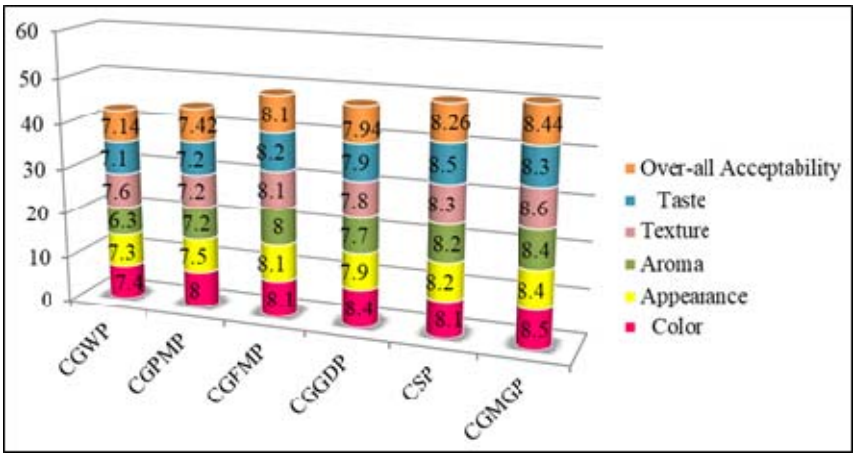

Fig 1: Graphical representation of organoleptic scores of developed food supplements

CFGWP	:	Choko flavored germinated wheat powder (sample I)
CFGPMP	:	Choko flavored germinated pearl millet powder (sample II)
CFGFMP	:	Choko flavored germinated finger millet powder (sample III)
CFGGGDP	:	Choko flavored germinated green gram dal powder (sample IV)
CFSP	:	Choko flavored soybean powder (sample V)
CFGMGP	:	Choko flavored germinated multi grain powder (sample VI)

Anthropometric and biochemical analysis of junior athletes

Mean weight of athletes of experimental and control study groups was 46.11±6.57kg and 45.79±4.98 kg recorded before supplementation. After completion of intervention, the mean weight of experimental study group was significantly (P<0.01) increased whereas the mean weight of control study group was little increased which was found non-significant (1.55) at 5%level. Mean body mass index of experimental study group at the end of feeding trial was recorded as 18.23±1.84kg/m^2,which was significantly increased at 1% while in the control study group marginal increase 17.74±1.22 kg/m^2 mean BMI was observed which was not statistically significant. At the pre and post supplementation no change was found in mean height and wais hip ratio of the athletes of both groups, respectively.

The mean value of fasting blood glucose of experimental study group was 79.83±5.57mg/dl before intervention which was improved to 88.15±5.75mg/dl after intervention period. FBG mean of experimental study group athletes was increased significantly at P<0.01(14.76) whereas the mean FBG 86.88±10.22mg/dl of athletes from control study group was improved to 87.27±9.96 which was less increase at P<0.05(1.98) as compared to experimental study group, respectively. Table 2 also reveals that the blood urea level in athletes of ESG was after the end of intervention period was 29.37±5.32mg/dl, significantly increase at P<0.01 (18.07), whereas the blood urea mean value of control study group was 27.80±6.27mg/dl, which was significantly changed at P<0.05 (2.44), respectively.

Table 2: Effect of supplementation on anthropometric measurements and blood profile of athletes

Anthropometric measurement	Experimental study group (n= 30)			Control study group (n=30)		
	Before	After	't' test	Before	After	't' test
Weight (Kg)	46.11±6.57	47.13±6.51	10.0**	45.79±4.98	45.91±5.00	1.55NS
Height(cm)	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	1.71NS
Waist-hip-ratio	0.74±0.05	0.74 ±0.05	-	0.76±0.05	0.76 ±0.05	-
Blood parameters						
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< 0.0 5 (1.96)
NS Non-significant **Values Significant at P< 0.01(2.58)

After 8 weeks intervention session, the total serum cholesterol level was highly increased than serum cholesterol level of control study group. It can be concluded that supplementation was helpful to improve nutritional status of athletes. 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 flavored germinated multi grain drinking powder which was increased significantly at P<0.01(14.70), whereas 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. Jose & Chandrasekhar (2013) supplementation study using IEB was carried out on 60 anaemic sports women. There was a significant improvement in the haematological parameters in all the experimental groups. The drastically changed in FBG, BU, TC and Hb level of experimental study group athletes was due to eight weeks supplementation of CFGMG drinking powder.

Sports potential of junior athletes

100 meter race was suitable field technique to check the endurance ability of athletes of both groups. For experimental study group 20.57±2.84seconds recorded a mean time to complete 100 meter race before intervention, which was improved to18.02±2.45seconds after intervention with a significantly mean time decrease at P<0.01 level (10.72) which was statistically significant at 1% level.

The high jump applied to test power and strength of athletes from both study groups. Athletes of experimental study group before supplementation could jump till 0.92±0.17 m which increased to 1.15±0.15meter after the supplementation which was statistically significant at 1% level (11.04), respectively. It was applied to test speed and strength of athletes of both study groups. The mean distance covered in long jump by athletes from both study groups was 2.63±0.63m (ESG) and 2.42±0.58 (CSG) before supplementation while after supplementation the mean distance covered by both study groups were 2.81±0.63meter (ESG) and 2.45±0.59m (CSG), respectively. Table 3 reveals that the experimental study group was significantly improved in performance in long jump to cover more distance at one percent level (7.82), whereas control study group did not improve the performance in long jump test which was found non-significant (1.68).

Table 3: Effect of supplementation on sports potential 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	0.84NS
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< 0.05(1.96)
NS Non-significant **Values Significant at P< 0.01(2.58)

Shuttle run test was applied for testing agility of athletes from experimental and control study group. The experimental study group recorded a mean time of 13.44±1.83seconds to complete 6 ×10M shuttle run before intervention, which improved as 10.65±1.59seconds after supplementation with significant result at P<0.01 (15.02), respectively. Whereas the control study group did not improve the running time in 6 ×10M shuttle run which was found non-significant (0.19) at 5% level. A study conducted by Devi and Kumari (2014) among female college athletes showed an average of 12.92 seconds for shuttle run. The subjects of the present research have registered better performance. The performance would be much better if the haemoglobin level of the subjects is improved, because the speed in these tests depends upon the oxygen carrying capacity of blood.

Conclusion

The investigation of the present study revealed that the addition of choko flavored germinated multigrain drinking powder in the daily diet of the experimental study group, 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 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 Hb level improved from 9.72±1.40g/dl to 11.23±1.30g/dl, which was resulted to eight weeks intervention of choko flavored germinated multi grain drinking powder. The positive impact of intervention of choko germinated multigrain drinking powder on the sports potential of athletes was seen.

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