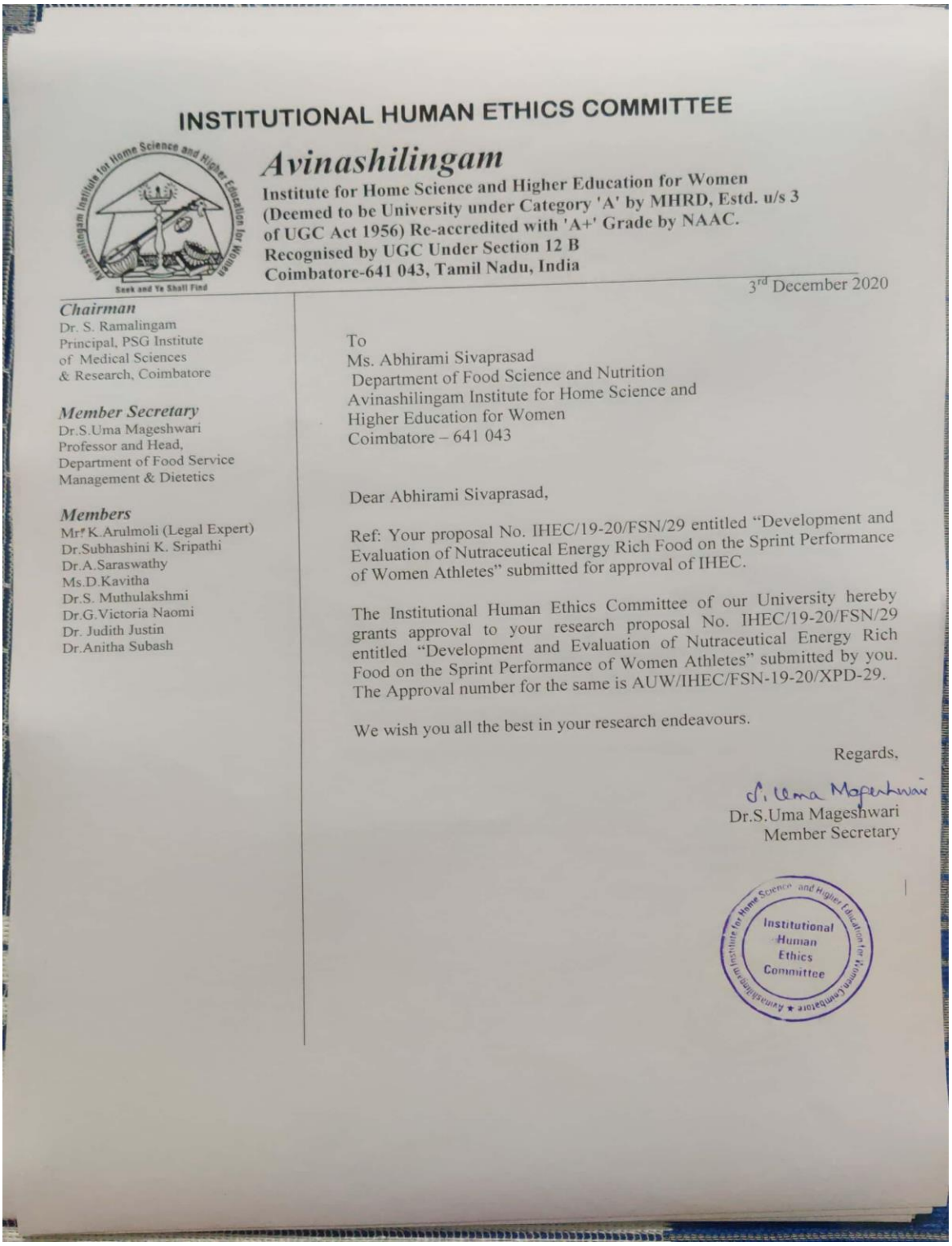
Appendix- 1



INSTITUTIONAL HUMAN ETHICS COMMITTEE

Avinashilingam

Institute for Home Science and Higher Education for Women
(Deemed to be University under Category 'A' by MHRD, Estd. u/s 3 of UGC Act 1956) Re-accredited with 'A+' Grade by NAAC.
Recognised by UGC Under Section 12 B
Coimbatore-641 043, Tamil Nadu, India

Seek and Ye Shall Find

3rd December 2020

Chairman
Dr. S. Ramalingam
Principal, PSG Institute of Medical Sciences & Research, Coimbatore

Member Secretary
Dr.S.Uma Mageshwari
Professor and Head,
Department of Food Service Management & Dietetics

Members
Mr. K.Arulmoli (Legal Expert)
Dr.Subhashini K. Sripathi
Dr.A.Saraswathy
Ms.D.Kavitha
Dr.S. Muthulakshmi
Dr.G.Victoria Naomi
Dr. Judith Justin
Dr.Anitha Subash

To
Ms. Abhirami Sivaprasad
Department of Food Science and Nutrition
Avinashilingam Institute for Home Science and Higher Education for Women
Coimbatore – 641 043

Dear Abhirami Sivaprasad,

Ref: Your proposal No. IHEC/19-20/FSN/29 entitled "Development and Evaluation of Nutraceutical Energy Rich Food on the Sprint Performance of Women Athletes" submitted for approval of IHEC.

The Institutional Human Ethics Committee of our University hereby grants approval to your research proposal No. IHEC/19-20/FSN/29 entitled "Development and Evaluation of Nutraceutical Energy Rich Food on the Sprint Performance of Women Athletes" submitted by you. The Approval number for the same is AUW/IHEC/FSN-19-20/XPD-29.

We wish you all the best in your research endeavours.

Regards,

S. Uma Mageshwari

Dr.S.Uma Mageshwari
Member Secretary

Institutional Human Ethics Committee

Appendix II

CTRI Trial Registration Inbox x

adm-ctri@nic.in via nic.in Mon, Aug 16, 2021, 3:57 PM

to me

Dear Concerned,

Trial REF/2021/08/046167 has been registered. The registration number for this trial is CTRI/2021/08/035705. Kindly note the same for your records. You are requested to update the trial every 6 months.

Regards
CTRI Team

Appendix III

From

Abhirami Sivaprasad
PhD Scholar,
Dept. of Food Science and Nutrition
Avinashilingam Institute for Home Science and Higher Education for Women,
Coimbatore-641043

To,

The Vice Chancellor
Avinashilingam Institute for Home Science and Higher Education for Women,
Coimbatore-641043

Through

The Registrar
The Dean, School of Home Science
The Head of the Department

Respected Madam

Sub: Seeking permission regarding;

I, Abhirami Sivaprasad (Reg. No.17PHFNF005), doing research under the valuable Supervision of Dr. Mrs. S Kowsalya, Registrar, Professor, Dept. of Food Science and Nutrition I have undertaken research on DEVELOPMENT AND EVALUATION OF NUTRACEUTICAL ENERGY RICH FOOD ON THE SPRINT PERFORMANCE OF WOMEN ATHLETES and regarding that I am in need of selecting samples. I request you to kindly grant me permission to select samples (sports students) from our institution for the same.

Thanking you

Coimbatore
26-11-2020

Yours sincerely

ABHIRAMI SIVAPRASAD

Sub to VC Madam
May be permitted
S. Kowsalya
26/11/20

To Registrar
Permitted
Thyagarajan
30/11/20

To Abhirami/HOD/FSN
Permitted
30/11

Appendix IV

INFORMED CONSENT FORMAT FOR RESEARCH PROJECTS

(Strike off items that are not applicable)

I Abhirami Sivaprasad is carrying out a study on the topic '**DEVELOPMENT AND EVALUATION OF NUTRACEUTICAL ENERGY RICH FOOD ON THE SPRINT PERFORMANCE OF WOMEN ATHLETES'** as part of my research project being carried out under the aegis of the Department of Food Science and Nutrition

My research guide is: Dr. S. Kowsalya, Registrar and Professor,
Department of Food Science and Nutrition

(Applicable to students only)

The justification for this study is: In the present scenario very few athletes have come up to international level to represent India in 100 mts and 200 mts. track and field event. But in advanced countries athletics are highly competitive. In comparison, our athletes are far behind. We have very dismal performance of athletes in the national and international sports competition. Proper Nutritional Care, Adequate Nutrition, healthy eating habits and specific training required for any athletes makes a transformable change in any athletic performance

Primary Objectives:

- Develop instant energy food product incorporating Nutraceutical rich foods.
- Evaluate the acceptability, shelf life, nutrient and Nutraceutical potentials of the developed product.

Secondary Objectives:

- Study the background details of Athletes.
- Assess the Nutritional Status, Body Composition and Physical Performance of athletes.
- Study the impact of supplementation of the developed Nutraceutical energy rich food among under 20 young adult women sprinters on the sports performance.

Sample size: 60

Study volunteers / participants are (specify population group & age group): 60(17-20 yrs)
Location of the study: Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore

We request you to kindly cooperate with us in this study. We propose collect background information and other relevant details related to this study. We will be carrying out:

Initial interview (specify approximate duration):15 minutes.

Data collected will be stored for a period of fifteen years. We will not use the data as part of another study.

Health education sessions: Number of sessions: 25

Approximate duration of each session: 15 minutes.

Clinical examination (Specify details and purpose):

- A blood glucose test is used to find out if your blood sugar levels are in the healthy range.
- A hemoglobin test measures the levels of hemoglobin in your blood. Hemoglobin is a protein in your red blood cells that carries oxygen from your lungs to the rest of your body.

Blood sample collection: Specify quantity of blood being drawn: 3ml.

No. of times it will be collected: 2

Whether blood sample collection is part of routine procedure or for research (study purpose):

☐ Routine Procedure ✓ Research Purpose

Specify purpose, discomfort likely to be felt and side effects, if any: No

Will the blood sample collected be stored after study period: ✓ No, it will be destroyed
Will the blood sample collected be sold: ✓ No
Will the sample collected be shared with persons from another institution: ☐ Yes ✓ No

Medication / supplementation given, if any, with duration, side effects, purpose, benefits:

Is the medication / supplementation given part of routine procedure: ☐ Yes ✓ No
(If no, state reasons for giving this medication/supplementation)
Are alternatives available for medication / supplementation given: ☐ Yes ✓ No
(If no, state reasons for giving this particular medication/supplementation)

Final interview (specify approximate duration): 20 minutes.

If photograph is taken, purpose: Yes, Documentation

Benefits from this study, if any :

- To produce low cost energy rich ready to eat food product for athletes

Risks involved by participating in this study, if any : NA

How will the results be used: Commercialization of the product

If you are uncomfortable in answering any of our questions during the course of the interview / biological sample collection, you have the right to withdraw from the interview / study at anytime. You have the freedom to withdraw from the study at any point of time. You will NOT be paid any remuneration for the time you spend with us for this interview / study. The information provided by you will be kept in strict confidence. Under no circumstances shall we reveal the identity of the respondent or their families to anyone. The information that we collect shall be used for approved research purposes only. You will be informed about any significant new findings – including adverse events, if any – whether directly or indirectly related to you or to other participants of this study, developed during the course of this research which may relate to your willingness to continue participation

Consent: The above information regarding the study, has been read by me/ read to me, and has been explained to me by the investigator(s). Having understood the same, I hereby give my consent to them to interview me, and collect biological sample 3 ml from me. I am affixing my signature / left thumb impression to indicate my consent and willingness to participate in this study (i.e., willingly abide by the project requirements)

Signature / Left thumb impression of the Study Volunteer / Legal Representative:

Signature of the Interviewer with date

Signature of the Witness with name: G Karishma Yadav

Appendix V

Patent Publication

(12) PATENT APPLICATION PUBLICATION

(19) INDIA

(22) Date of filing of Application :28/03/2021

(21) Application No.202141013795 A

(43) Publication Date : 02/04/2021

(54) Title of the invention : A PROCESS OF PREPARATION OF ATHLETES™ NUTRI BAR AND PRODUCT THEREOF

(51) International classification	:A23L0025000000, A23L0007126000, A23L0025100000, A23L0007117000, A21D0002380000
(31) Priority Document No	:NA
(32) Priority Date	:NA
(33) Name of priority country	:NA
(86) International Application No	:NA
Filing Date	:NA
(87) International Publication No	: NA
(61) Patent of Addition to Application Number	:NA
Filing Date	:NA
(62) Divisional to Application Number	:NA
Filing Date	:NA

(71)**Name of Applicant :**
1)AVINASHILINGAM INSTITUTE FOR HOME SCIENCE AND HIGHER EDUCATION FOR WOMEN
Address of Applicant :BHARATHI PARK ROAD TATABAD, FOREST COLLEGE CAMPUS SAIBABA COLONY, COIMBATORE TAMIL NADU INDIA 643041 Tamil Nadu India

(72)**Name of Inventor :**
1)ABHIRAMI SIVAPRASAD
2)Dr. S. KOWSALYA

(57) Abstract :

APPLICANT: AVINASHILINGAM INSTITUTE FOR HOME SCIENCE AND HIGHER EDUCATION FOR WOMEN TITLE: A PROCESS OF PREPARATION OF ATHLETES™ NUTRI BAR AND PRODUCT THEREOF ABSTRACT The present invention

Appendix VI

Estimation of Nutrients

Determination of Total carbohydrate by Anthrone Reagent

Reagents

- 2.5N HCl
- Anthrone reagent: Dissolve 200 mg anthrone in 100 ml of ice-cold 95% Sulphuric acid. Prepare fresh before use
- Standard Glucose (stock): Dissolve 100 mg in 100 ml distilled water
- Working standard: 10 ml of stock diluted to 100 ml with distilled water. Store refrigerated after adding a few drops of Toluene

Procedure

1. Weigh 100 mg of the sample in to a boiling tube
2. Hydrolyze by keeping it in a boiling water bath for 3 hours with 5 ml of 2.5 N HCl and cool to room temperature
3. Neutralize with solid Sodium carbonate until the effervescence ceases
4. Make up the volume to 100 ml and centrifuge
5. Collect the supernatant and take 0.5 and 1 ml aliquots for analysis
6. Prepare the standards by taking 0, 0.2, 0.4, 0.6, 0.8 and 1 ml of the working standard, '0' serves as blank
7. Make up the volume to 1 ml in all the tubes including the sample tubes by adding distilled water
8. Then add 4 ml of Anthrone reagent
9. Heat for 8 minutes in a boiling water bath
10. Cool rapidly and read the green to dark green colour at 630 nm
11. Draw a standard graph by plotting concentration of the standard on the X-axis versus absorbance on the Y-axis
12. From the graph calculate the amount of carbohydrate present in the sample tube

Ref: FSSAI Manual

Determination of Energy/Calories: BY calculation method

(Total Fat value x 9) + (Protein value x 4) + (Carbohydrate value x 4) = Energy

Protein Estimation

Principle

The protein content is determined from the organic Nitrogen content by Kjeldahl method. The various nitrogenous compounds are converted into ammonium sulphate by boiling with concentrated sulphuric acid. The ammonium sulphate formed is decomposed with an alkali (NaOH) and the ammonia liberated is absorbed in excess of standard solution of acid and then back titrated with standard alkali.

Apparatus

a. **Kjeldahl digestion flask** - 500 or 800 ml

b. **Kjeldahl distillation apparatus,** - same digestion flask fitted with rubber stopper through which passes lower end of efficient rubber bulb or trap to prevent mechanical carryover of NaOH during distillation or apparatus as shown below.

c. **Conical flask, 250 ml**
d. **Burette 50 ml**.

Reagents

a. Concentrated Sulphuric acid - sp gr 1.84
b. Sodium Hydroxide solution - 45%. Dissolve 450 gm of Sodium Hydroxide in 1000 ml water
c. Standard Sulphuric acid solution – 0.1 N

d. Standard Sodium Hydroxide solution – 0.1

e. Methyl red Indicator solution - Dissolve 0.5 gm methyl red in 100 ml of alcohol

Procedure

Weigh quickly about 1-2 g of the sample and transfer to a 500 or 800 ml Kjeldahl flask taking care to see that no portion of the sample clings to the neck of the flask. Add 0.7 gm. of Mercuric oxide, 15 gm. of Potassium Sulphate and 40 ml of concentrated sulphuric acid (Mercuric oxide is added to increase the rate of organic breakdown during acid digestion. Because of environmental/safety concerns over handling and disposal of mercury, copper sulphate can be used. This is important from safety point of view as mercury vapors might escape into the environment during the distillation process. Also Missouri catalyst tablets known as Kjeldahl tablets (Composition: 48.8% Sodium sulphate & 48.9% Potassium sulphate & 0.3 % copper sulphate can also be used). Add two to three glass beads. Place the flask in an inclined position on the stand in the digestion chamber and digest. Heat the flask gently at low flame until the initial frothing ceases and the mixture boils steadily at a moderate rate. During heating rotate the flask several times. Continue heating for about an hour or more until the colour of the digest is pale blue. If Black specs are present after 30 minis of digestion, wrap the vessel with aluminum foil and keep for 2-3 minis. By doing this black specs would move down from the walls in the digestion mixture. If the specs are still present, remove the vessel from heat and allow to cool for 10 mins. Do not modify the heat intensity in the whole process. Alternatively, few drops of water may also be pour down across the side of the flask. Cool the digest and add slowly 200 ml of water. Cool, add a piece of granulated Zinc or anti bump granules and carefully pour down the side of the flask sufficient NaOH solution (450 gm/liter) to make the contents strongly alkaline (about 110 ml) before mixing the acid and alkaline layer.

Connect the flask to a distillation apparatus incorporating an efficient flash head and condenser. To the condenser fit a delivery tube which dips just below the surface of the pipette volume of standard acid contained in a conical flask receiver. (Precaution: The receiving solution must remain below 45 ^{o}C to prevent loss of

ammonia). Mix the contents of the digestion flask and boil until 150 ml have distilled into the receiver. Add 5 drops of methyl red indicator and titrate with 0.1 N NaOH solutions.

Carry out a blank titration simultaneously. 1 ml of 0 .1 N (H_2 SO_4) = 0.0014gm N.

Calculations:

Nitrogen content (N) in g=(A-B)-(C-D) x 0.0014

where

A=volume in ml 0.1 N acid measured for main distillation,
B=volume in ml 0.1 N alkali used for back-titrating A,
C=volume in ml 0.1 N acid measured for blank distillation, and
D=volume in ml 0.1 N alkali used for back-titrating C.

$$\text{Calculate protein as on basis} = \frac{\text{N x Convertion factors x 100}}{\text{Weight of the sample}}$$

$$\text{Protein on dry wt. basis} = \frac{\text{Protein content x 100}}{\text{(100 – Moisture content)}}$$

Ideally the protein content of food stuff is calculated by multiplying its total nitrogen content by 6.25, This factor is used whenever the nature of the protein is unknown or when the product to be analyzed is a mixture of different proteins with different factors. However use of different Nitrogen conversion factors for different matrices may lead to better accuracy of results.

Reference :-

FSSAI Manual of methods

Determination of Fat Content.

Reagents

- Petroleum Ether - of boiling range 40°C to 60°C.

Procedure

Weigh accurately about 2.5 g of the dried material into thimble and extract with petroleum ether in a Sox let or other suitable extractor. The extraction period may vary from 4 hours at a condensation rate of 5 to 6 drops per second to 16 hours at 2 to 3drops per second. Dry the extract on a steam-bath for 30 minutes, cool in a

desiccator and weigh. Continue at 30 minute intervals this alternate drying and weighing until the difference between two successive weighing is less than one mg. Note the lowest mass.

Calculation

$$\text{Crude fat (on moisture-free basis), Percent by mass} = \frac{100\,(M_1 - M_2)}{m}$$

Where

M_1 = mass in 'g' of the extraction flask with dried extract,

M_2 = mass in 'g' of the extraction flask, and

m = mass in 'g' of the dried sample taken for the test

Reference: AOAC 20th Edition

Estimation of Calcium

Procedure:

- The sample was treated with concentrated hydrochloric acid, transferred to a volumetric flask and made up o 100 ml.
- Take above 100ml in conical flask.
- Add 2-3 drops of sodium hydroxide 1N solution and to raise the pH 12 - 13.
- Add a pinch of Patton & Reeder indicator and stir well.
- Titrated against the solution with 0.01M EDTA
- The end point is appearance of blue colour.

Calculation:

$$\textbf{Calcium (Ca), mg/l} = \frac{\textbf{A x B x1000}}{\textbf{V}}$$

Where

A = Volume in ml of EDTA solution used for titration,

B =Mass in mg of calcium equivalent to 1ml of EDTA solution, and

C =Volume in ml of the sample taken for the test.

Reference: AOAC/BIS/FSSAI

Estimation for Magnesium

Procedure:(I)

The sample was dried in an air oven at 105°c for 3 hours. The dried sample was next charred. The charred sample was ashed in a muffle furnace at 550°C until the whitish or greyish ash was obtained. The ash was treated with concentrated hydrochloric acid, transferred to a volumetric flask and made up 100 ml.

Take 50 ml of sample in conical flask. Add 2-3 drops of buffer solution. Add a pinch of EBT indicator. Titrated against the solution with 0.01M EDTA .

The end point is appearance of blue colour.(V2)

Procedure: (II):

Take 50 ml of digested food sample in conical flask. Add 2-3 drops of sodium hydroxide 1N solution and raise the pH 12 -13. Add a pinch of patton & Reeder indicator and stir well then add small pinch of murexide indicator solution . Titrated against the solution with 0.01M EDTA.

The end point is pink colour changes to pale blue colour.(V1)

Calculation:

$$\textbf{Magnesium (Mg), mg/l} = \frac{0.02435 \times 1000 \times (V2-V1)}{W}$$

Where

W = Weight of sample taken for the test,

V1 =Volume in ml of EDTA consumes in titration for calcium determination in the same aliquot of solution of sample.

V2 =Volume in ml of EDTA solution consumed in titration.

Reference: AOAC/BIS/FSSAI

Determination of Zinc

1.0 Scope:

This standard prescribes **the *Atomic absorption spectrophometric*** method for the determination of zinc present in the sample.

2.0 Reference :

AOAC

3.0 Apparatus:

3.1 Atomic absorption spectrophotometer with air acetylene flame.

3.2 Hallow cathode lamp – 213.8 nm.

4.0 Reagent:

4.1 Zn (*NIST traceable).*

4.2 Nitric acid (1:499).

4.3 Conc. HCL.

5.0 Procedure:

5.1 Take 100 ml standard flask

5.2 Prepare Zn standards (*Nist traceable*) to 0.05, 0.075, 0.1, 0.125, 0.15&0.2 mg/l in nitric acid (1:499).

5.3 Prepare a blank solution in 100ml distilled water.

5.4 Take 1-2gm of sample in a beaker and digest with 50 ml. of conc. HCL till the volume reduced to three fourth

5.5 Cool and filter and make up to 100 ml. with distilled water.

5.6 Process the blank also in the above manner.

5.7 Set the AAS as per the specific work instruction.

5.8 Aspirate the blank, standards and sample solutions.

5.9 Measure the absorbance of the zinc at 213.8nm.

6.0 Calculation:

6.1 Draw the standard calibration graph by plotting the absorbance Vs standard conc. for each Standard.

6.2 Process a standard at detection level (0.01 ppm) as quality control check with every batch of samples and measure its conc. from the Calibration graph.

Estimation of Beta-carotene:

sample was taken in 150 ml glass stoppered Erlenmeyer flask and 40 ml water saturated butanol (WSB) was added. The contents of the flasks were mixed vigorously for 1 minute and kept overnight (16-18 hrs) at room temperature under dark for complete extraction of β-carotene. Next day, the contents were shaken again and filtered completely through the Whatman no.1 filter paper into a 100 ml volumetric flask. The optical density of the clear filtrate was measured at 440 nm using spectrophotometer.

Pure WSB was used as blank. The β-carotene content was calculated from calibration curve from known amount of β-carotene as discussed below and expressed as parts per million (ppm). Standard solution of β-carotene (Sigma) was prepared in water saturated butanol (WSB) at the concentration of 5 µg/ml. WSB is prepared by mixing n-butanol with distilled water in 8:2 ratios.

Calibration curve is made from known amounts of pure β-carotene from 0.25 µg/ml to 1.5 µg/ml which are prepared after suitable dilutions of original stock with WSB in calibrated 10 ml volumetric flasks (from 0.5 ml to 3 ml of standard solution in 10 ml). Absorbance of each dilution is measured and a calibration curve is established.

β-carotene content of unknown samples is calculated from standard curve.

Ref: Biochemical methods/AOAC

Determination of Iron

Apparatus:

3.1 Atomic absorption spectrophotometer with air acetylene flame

3.2 Cathode Lamp-Fe – 248.3 nm.

Reagent:

4.1 Fe (*NIST traceable)*

4.2 Nitric acid (1:499).

4.3 $CaCl_2$ solution:

Dissolved 630 mg $CaCO_3$, 50 ml of 20% v/v HCL, if required boil gently to obtained complete solution. Cool and dilute to 1000 ml with distilled water.

Procedure:

5.1 Take 100 ml standard flask

5.2 Prepare Iron standards (*Nist traceable*) to 0.05,0.1, 0.125,0.15,0.20&0.25 mg/l in nitric acid (1:499) from 1000 ppm solution.

5.3 Prepare a blank solution in 100ml distilled water.

5.4 Take 1gm of dried sample in a beaker and digest with 0.5 ml. of conc. Nitric acid and add 25 ml $CaCl_2$ till the volume reduced to three fourth.

5.5 Make up to 100 ml. with distilled water.

5.6 Process the blank also in the above manner.

5.7 Set the AAS as per the specific work instruction.

5.8 Aspirate the blank, standards and DIGESTED FOOD SAMPLE solutions.

5.6 Measure the absorbance of the iron at 248.3nm.

6.0 Calculation:

6.1 Draw the standard calibration graph by plotting the absorbance Vs standard conc. for each standard

6.2 Calculate the concentration of Iron content from the sample through calibration graph.

7.0 Reference:

AOAC / FSSAI

Determination of Ash Content

Weigh accurately about 1-2 gms of sample in a tared silica / platinum dish Char the material carefully on a burner and transfer the dish to a muffle furnace and ash at a temperature of 550 ±10° C until the ash is free of Carbon.

Heat the dish again at 550 ± 10° C for 30 minutes Cool in a desiccator and weigh. Repeat this process of heating for 30 minutes, cooling in a dessicator and

weighing until the difference between two successive weighing's is less than 1 mg. Record the lowest weight.

$$\text{Total ash (\% on dry weight)} = \frac{(W2 - W) \times 100 \times 100}{(W1 - W) \times (100 - M)}$$

W1 = Weight in gms of Silica dish. + sample W2 = Weight in gms of Silica dish + ash W = Weight in gms of empty Silica dish. M = Moisture % of the sample.

Ref: FSSAI Manual/AOAC

Determination of moisture:

Weigh accurately about 2-5 gm of sample in a tared aluminium dish. Dry in an air oven at 100 ±2° C for 5 to 6 hours. Cool in dessicator and weigh. Dry again for 30 minutes and cool in a dessicator and weigh. Repeat the process of heating and cooling in a dessicator until the difference in two successive weighing is less than 1 mg.Record the lowest weight. Carry out the determination in duplicate.

Calculation :

$$\text{Moisture (\%)} = \left(\frac{W1 - W2}{W1 - W}\right) \times 100$$

Where, W = Weight in gms of Aluminium dish. W1 = Weight in gms, of Aluminium dish + sample before drying. W2 = Weight in gms, of Aluminium dish + dried sample.

Ref: FSSAI/AOAC

Determination of Phytochemical (Quantitative Method)

Determination of Alkaloid:

The sample was dissolved in dimethyl sulphoxide (DMSO), added 1ml of 2 N HCl and filtered. This solution was transferred to a separating funnel, 5 ml of bromocresol green solution and 5 ml of phosphate buffer were added. The mixture was shaken with 1, 2, 3 and 4 ml chloroform by vigorous shaking and collected in a 10-ml volumetric flask and diluted to the volume with chloroform. A set of reference standard solutions of atropine (20, 40, 60, 80 and 100 µg/ml) were prepared in the

same manner as described earlier. The absorbance for test and standard solutions were determined against the reagent blank at 470 nm with an UV/Visible spectrophotometer. The total alkaloid content was expressed as mg of AE/g of extract.

Determination of Total flavonoid content:

Total flavonoid content was measured by the aluminium chloride colorimetric assay. The reaction mixture consists of 1 mg of sample and 4 ml of distilled water was taken in a 10 ml volumetric flask. To the flask, 0.30 ml of 5 % sodium nitrite was treated and after 5 minutes, 0.3 ml of 10 % aluminium chloride was mixed. After 5 minutes, 2 ml of 1M Sodium hydroxide was treated and diluted to 10 ml with distilled water. A set of reference standard solutions of quercetin (20, 40, 60, 80 and 100 µg/ml) were prepared in the same manner as described earlier. The absorbance for test and standard solutions were determined against the reagent blank at 510 nm with an UV/Visible spectrophotometer. The total flavonoid content was expressed as mg of QE/g of extract.

Estimation for Saponin:

Total saponin determination was done using anisaldehyde reagent. Sample solution was prepared in water. Standard saponin solution, Weigh 10 mg of diosgenin, dissolve in 16 mL of methanol, and add 4 mL of distilled water. Standard solutions of diosegenin (20, 40, 60, 80 and 100 µg/ml) were prepared 80% aqueous methanol. Mix thoroughly and start pipetting immediately. For total saponins estimation 500 µg of sample, 500 µl of 0.5% anisealdehyde reagent, were mixed and kept aside for 10 min. Later, 2 ml of 50% sulphuric acid reagent was added and tubes were mixed. Tubes were then kept in water bath with constant temperature of 60º. After 10 min tubes were cooled and absorbance was taken at 435 nm. Same method for standard also. The amount of saponins was calculated as saponin equivalent from the calibration curve of standard .

Terpenoid determination:

Preparation of the reference solution: Linalool reference substance (10mg) was accurately weight, added in a 10ml volumetric flask, diluted with ethyl acetate to the marked line to afford a concentration of 1.0mg/ml standard solution.

Preparation of the test solution: The sample was precisely measured and placed in a 10ml volumetric flask, diluted with ethyl acetate to the marked line.

Chromogenic method: The color developing agent applied on this experiment was prepared by the procedure as follows, 5% vanillin-acetic acid solution plus 2mL of perchloric acid were heated at 65℃ for 20min, then cooled in ice water and warmed up to room temperature after being shaken. Vanillin (500mg) was dissolved in acetic acid (10ml) to prepare the vanillin solution.

The standard curve 0.0,0.2,0.4,0.8,1.2,1.6,2.0 ml Linalool standard solution were precisely measured, placed in a 10 ml flask with ethyl acetate to volume marked line, The sample solution and standard mixture was then shaken, colored according to the chromogenic method. The absorbance (A) of each solution was measured at 210nm wavelength, a blank solution as the control reference.

Determination of Glycosides:

Glycosides of each generation of suspension culture were quantitatively determined according to Solich et al. by some modifications For determination of glycosides, a 10% extract of seeds were mixed with 10 mL freshly prepared Baljet's reagent (95 mL of 1% picric acid + 5 mL of 10% NaOH). After an hour, the mixture was diluted with 20 mL distilled water and the absorbance was measured at 495 nm by UV/VIS spectrophotometer.

For preparation of the standard curve, 10 mL of different concentrations (12.5-100 mg/L) of securidaside were prepared. Total glycosides from were expressed as mg of securidaside per g of dried Sample.

Determination of total phenolic content: The concentration of phenolics in plant extracts was determined using spectrophotometric method. Folin-Ciocalteu assay method was used for the determination of the total phenol content. The reaction mixture consists of 1 ml of extract and 9 ml of distilled water was taken in a volumetric flask (25 ml). One millilitre of Folin-Ciocalteu phenol reagent was treated to the mixture and shaken well. After 5 minutes, 10 ml of 7 % Sodium carbonate (Na_2CO_3) solution was treated to the mixture. The volume was made up to 25 ml. A set of standard solutions of gallic acid (20, 40, 40, 60, 80 and 100 µg/ml) were prepared in the same manner as described earlier. Incubated for 90 min at room temperature and

the absorbance for test and standard solutions were determined against the reagent blank at 550 nm with an Ultraviolet (UV) /Visible spectrophotometer. Total phenol content was expressed as mg of GAE/gm of extract.

Determination of tannin Content: The tannins were determined by Folin - Ciocalteu method. About 0.1 ml of the sample extract was added to a volumetric flask (10 ml) containing 7.5 ml of distilled water and 0.5 ml of Folin-Ciocalteuphenol reagent, 1 ml of 35 % Na2CO3 solution and dilute to 10 ml with distilled water. The mixture was shaken well and kept at room temperature for 30 min. A set of reference standard solutions of Tannic acid (20, 40, 60, 80 and 100 µg/ml) were prepared in the same manner as described earlier. Absorbance for test and standard solutions were measured against the blank at 725 nm with an UV/Visible spectrophotometer. The tannin content was expressed in terms of mg of Tannic acid /g of extract.

Phytochemicals screening test: (Qualitative)

Test for Tannins

10 ml of bromine water was added to the 0.5 g aqueous extract. Decoloration of bromine water showed the presence of tannins.

Test for Saponins

5.0 ml of distilled water was mixed with aqueous extract in a test tube and it was mixed vigorously. The frothing was mixed with few drops of olive oil and mixed vigorously and the foam appearance showed the presence of saponins.

Tests for Flavonoids

Alkaline Reagent Test. 2 ml of 2.0% NaOH mixture was mixed with aqueous extract; concentrated yellow color was produced, which became colorless when we added 2 drops of diluted acid to mixture. This result showed the presence of flavonoids.

Tests for Glycosides

Liebermann's Test. We added 2.0 ml of acetic acid and 2 ml of chloroform with whole aqueous extract. The mixture was then cooled and we added

H_2SO_4 concentrated. Green color showed the entity of aglycone, steroidal part of glycosides.

Test for Terpenoids

2.0 ml of chloroform was added with the 5 ml aqueous extract and evaporated on the water path and then boiled with 3 ml of H_2SO_4 concentrated. A grey color formed which showed the entity of terpenoids.

Test for Alkaloids:

Sample is dissolved in dilute Hydrochloric acid and filtered.

Mayer's Test: Filtrates were treated with Mayer's reagent (Potassium Mercuric Iodide). Formation of a yellow coloured precipitate indicates the presence of alkaloids.

Test for Phenols: 2 ml of distilled water followed by few drops of 10% ferric chloride was added to 1ml of the sample extract. Formation of blue or green color indicates presence of phenols.

Antioxidant assay:

Total Antioxidant Capacity assay:

Procedure:

The total antioxidant capacity of the Methanol extract of the sample was evaluated by the phosphomolybdenum method according to the procedure.

A 0.3 mL of extract was combined with 3 mL of reagent solution (0.6 M sulfuric acid, 28 mM sodium phosphate and 4 mM ammonium molybdate).

The tubes containing the reaction solution were incubated at 95°C for 90 min.

Then, the absorbance of the solution was measured at 695 nm using a UV-VIS spectrophotometer against blank after cooling to room temperature.

Methanol (0.3 mL) in the place of extract was used as the blank.

The total antioxidant activity is expressed as the number of gram equivalent of ascorbic acid.

The calibration curve was prepared by mixing ascorbic (1000, 500, 250, 125, 62.5 and 31.25 µg/mL) with methanol.

Ref: Analytical Biochemistry

Shelf life Analysis

Standard operating procedure for Total fungal count (yeast and Mould count) by Colony Count Technique at 25°C

1. Scope

This standard specifies the method for viable fungal count in products intended for human consumption or feeding of animals by means of the colony count technique at 25°C.

2. References is 5403:1999 reaffirmed 2005

3. Principle

Two poured Plates are prepared using a specified culture medium with specified quantity of sample (if liquid) or Initial suspension (If solid) & other pair of Plates prepared under same condition with decimal dilution of test sample incubated aerobically at **25°C for 3, 4 or 5 days.**

4. Culture media and dilution fluid

4.1 diluents

0.1% Peptone salt solution – Himedia M1748 Sterilized by autoclaving at 121° C/15 lbs pressure

4.1.1 Initial Suspension/ *Food Homogenate*

1gm of the test sample (Grind if required) added to 9ml of diluents – 10^{-1}(or)

25gm of the test sample (Grind if required) added to 225 ml of diluents – 10^{-1}

Non viscous liquid measure volumetrically 10 ml sample added to 90ml of diluents- 10^{-1}

Viscous liquid weigh the sample 10 $\pm$ 1 g sample in 90ml of diluents- 10^{-1}

4.1.2 Decimal Dilution

1ml of initial dilution to the 9 ml diluents 10^{-2} , 1ml from 10^{-2} to 9ml diluents 10^{-3}…..10^{-4},10^{-5} accordingly

4.2 Culture Media [Chloramphenicol Yeast Glucose Agar]

4.2.1 Media Preparation: Himedia M1008 - pH 6.6 ±0.2

Suspend 4.0 grams in 100 ml distilled water. Heat to boiling to dissolve the medium completely

Sterilize by autoclaving at15 lbs pressure (121°C) for 15 minutes.

Cool in water bath at 44 °C to 47 °C before use, Mix well before pour into sterile Petri Plates.

5.0 preparation of test sample

Food Homogenate prepared as per procedure 4.1.1

Mix using vortex mixture (5 to 10 sec) allow the particles to settle and then transfer

6. Procedure.

6.1 Dilution

As discussed in (4-4.1.2)

6.2 Inoculation

- Take two sterile Petri dishes transfer to each dish, by means of a sterile pipette 1 ml of the test sample from 10^{-2} dilution or desired
- Take two other sterile Petri dishes transfer to each dish, by changing the tip 1 ml of the test sample from the next dlution .
- Fallow similar procedure until the required dilution to be Plated
- Pour about 15 ml of the Chloramphenicol Yeast Glucose Agar (4.2) at 45 °± 1°C into each Petri dish; carefully mix the inoculum with the medium by rotating the Petri dishes.
- Allow the mixture to solidify by leaving the Petri dishes standing on a cool horizontal surface

(Note: The time elapsing between the preparation of the initial suspension / dilution and the product is moment the medium poured into the dishes shall not exceed 15 min.)

6.3 Incubation

Invert the prepared dishes and incubate at 25 °C ± 1 °C for 3,4,5 Days

Do not stack the dishes more than six high.

Stacks of dishes should be separated from one another and from the walls and top of the incubator.

6.4 Interpretation

Count the colonies on each Plate after 3, 4 and 5 days of incubation. After 5 days, retain those Plates containing fewer than 150 colonies If over growth observed count the number of colonies at 3 rd & 4thday and mention the incubation time in report It is advisable to examine the Plates at the end of three days for yeast colonies as they are likely to be overgrown by mould growth. If only yeast counts are required, add 0.25 percent of sterile sodium propionate solution to the Plate at the time of pouring to inhibit the growth of moulds.

6.4 Counting of the colonies

Count the colonies using colony counter after required incubation

Use counts from Plates containing fewer than, 150 colonies.

7. Expression of results

7.1 Method of calculation

The number *N* of microorganisms present in the test sample per ml (liquid products) or per gram (other Products).

$$N = \frac{\sum C}{[(1 \times n_1) + (0.1 \times n_2) \times (d)}$$

Where

. ∑C= the sum of the colonies counted on all the Plates;

nl = the number of Plates counted in the first dilution;

nl = the number of Plates counted in the second dilution

d= the dilution from which the first counts were obtained (for example, 10-1).

Round the result obtained to two significant figures.

The result shall be expressed as a number between 1.0 and *9.9* multiplied by 10x, where x is the appropriate power of 10.

Appendix VII

QUESTIONAIRRE

SOCIO-ECONOMIC STATUS OF SPRINTERS

1. Name :

2. Age :

3. Sex : **Male** ☐ **Female** ☐

4. Religion : **Hindu** ☐ **Muslim** ☐ **Cristian** ☐ **Other** ☐

5. Area of residence : **Urban** ☐ **Rural** ☐

6. Address :

7. Type of family : **Joint** ☐ **Nuclea** ☐

8. Family Details :

S. No	Name of the Members	Relation to the head of the family	Marital status	Education	Occupation	Income per month

1. Illiterate 2. Dropout 3. High School 4. Higher Secondary 5 Graduate 6 Post graduate

DIETARY ASSESSMENT

1. Are you a:
   Vegetarian ☐ Non-vegetaria ☐ Ovo- vegeta ☐

2. Which beverage do you drink in the morning?
   Tea ☐ coffee ☐ milk ☐ fruit ☐ juice ☐ Water

3. How many meals do you consumed per day?
   2 times ☐ 3 times ☐ 4 times ☐

4. What are the types of fluids you consume?
   a. Water b. Water and Juice
   Quantity (in l)

   a. 1 to 2 ☐ b. 2 to 3 ☐ c. 3 to ☐

5. Your diet:

a) is different every day ☐ b) is different only sometimes during a week ☐

c) is different only during the weekend ☐ d) is very monotonous ☐

6. Do you have any known food allergies?

   a) Yes ☐ b) No ☐

   If yes, mention the food sources:

7. What types of food do you consume before competition?

   a. Solid ☐ b. Semi solid ☐ c. Liquid ☐

8. How do you manage stress?

   a. Music ☐ b. Books ☐ c. Yoga ☐ d. Sport ☐ ☐ e. Others

Food Frequency Questionnaire

Food Item	Daily	Weekly once	Weekly Twice	Weekly Thrice	Fort nightly	Monthly	Occasionally	Never
Cereals								
Rice %								
Wheat								
Maize								
Pulses								
Peas								
Bengal gram								
Black gram								
Green gram								

Red gram								
Soybean								
Rajmah								
Green leafy Vegetables								
Amaranthus								
Cabbage								
Curry leaves								
Coriander leaves								
Spinach leaves								
Mint leaves								
	Other Vegetables							
Potato								
Onion								
Snake gourd								
Bottle gourd								
Cauliflower								
Plantain								
Beans								
Ladies finger								
	Condiments and Spices							
Garlic								
Ginger								
Turmeric								
	Fruits							
Amla								
Banana								
Orange								
Guava								
Tomato								
	Meat, Fish and Poultry							
Fish								
Mutton								
Chicken								
Egg								
Milk and Milk products								
Milk								
Curd								
Paneer								

Fats and oils								
oil								
Sugar and Jaggery								
Sugar								

Information about daily routine

a) Do you practice your game every day?
-
If yes, how many hours do you practice it?

i) 1h–2h in a day ii) 3–4h in a day iii)More than 4h in a day iv) >1 hour

24 hour dietary recall method

Name:

Daily meals pattern

Meals	Menu	Amount	Ingredients
Breakfast			
Mid morning			
Lunch			
Mid afternoon			
Evening			
Dinner			
Bed time			

HEALTH PROFILE

Family history		Past History	
Disease	**Yes /No**	**Disease**	**Yes/No**
Hypertension		Jaundice	
Diabetes		Anaemia	
Asthma		Tuberculosis	
Heart disease		Malaria	
Tuberculosis		Athrititis	
Mental illness		Exercise induced Dizziness	

Cancer		Heat stoke	
Obesity		Head injury	
Sudden death<age 50		Fracture	
Personal history		Surgery	
Diabetes		Blood transfusion	
Hypertension		Chest pain during exercise	
Heart disease		Racing of heart beat during exercise	
Hypoglycemia		Hospitalization	
Epilepsy		**Immunization**	
Allergies		Tetanus	
Asthma		Typhoid	
Sleeping disorders		Cholera	
Celiac disease			
Deverticulitus			

Disease from the past few weeks	**Always**	**Often**	**Sometimes**	**Never**	Hepatitis B	
Headache					Hepatitis A	
Diarrhoea					Measles	
Constipation					H. Influenza B	
Fever /cold					Chicken pox	
Indigestion					Yellow fever	
Personal habits						

Smoking						
Alcohol						
Food supplement						
Inhaler						
Vitamins						
Medications						

ANTHROPOMETRY

Name :

Address:

Phone No. :

Anthropometry	**Ist**	**2nd**	**3rd**
Age			
Height (c			
Weight (kg)			
Chest circumference (cm			
Waist (cm)			
Hip (cm)			
WHR			
Body Composition			
Fat Mass(kg)			
Fat free Mass(kg)			
Total Body Water(kg)			
Lean Body mass(kg)			
BMR(kcal)			
BMI			
Skinfold (mm)			
Triceps			
Subscapular			
Biceps			
Supra iliac			

BIOCHEMICAL ASSESSMENT

Blood Haemoglobin :
Serum Lactate Dehydrogenase :
Blood Glucose:

CLINICAL ASSESSMENT

Presence of Deficiency Symptoms	**Present / Absent**
Clinical sign	
Low body weight	
Night blindness	
Conjunctival xerosis	
Bitot spotCorneal Xerosis	
Keratomalasia	
Angular Stomatitis	
Sclerosis	
Dental Caries	
Goiter	
Palpate	

NUTRITION EDUCATION QUESTIONAIRE (KAP) METHOD

A. Knowledge related questions

1. Diet which contain all the essential nutrients is called

a) Balanced diet b) Nutritional food ingredients c) nutrients d) Good nutrients

2. Colored vegetables and fruits contain

a) Vitamin b) Iron c) Fiber d) All of them

3. Which of the following fluid is the best for dehydration?

a) Oral rehydration solution b) Milk c) Water d) Honey

4. Which mineral is lost during dehydration?

a) Sodium and Potassium b) Iron and Zinc c) Selenium and Copper d) Only iron

5. Which of the following is the best source for treating constipation?

a) Dietary fiber b) Medicine c) Exercise d) Water

6. Which of the following is the best source of energy for sports person?

a) Carbohydrate b) protein c) fat d Iron

7. Drinking sugar solution immediately before exercise

a) Enhance performance b) delay fatigue c) Produce fatigue d) Provide energy

8. Which of the following symptoms occur in dehydration?

a) Muscle Fatigue b) Increase body weight c) Soften Bone d) Increase blood volume

9. Which food does contain dietary fiber?

a) Corn b) refined wheat flour c) white bread d) meat

10. Which of the following nutrient is the most needed after exercise?

a) Carbohydrates and Protein b) only protein c) Only fat d) carbohydrate

11. What do you think about the following statements?

Statements	Responses	
	Yes	No
For morning event ,the meal should be high carbohydrate at night and light breakfast at morning		
For afternoon event, the dinner at night and the breakfast in the morning should be high carbohydrate meals and the lunch should be light meals.		
For evening event, the breakfast and the lunch should be high carbohydrate meals followed by light meals.		
Vitamins and minerals are required in small quantities for proper functioning of the body.		
Minerals are needed in activating numerous reactions that release energy during the breakdown of carbohydrate, lipid and protein.		
A significant reduction in the dietary lipid can lead to reduced level of fat soluble vitamins.		

Appendix VIII- Estimation of Biochemical Parameters

Estimation of Serum Lactate DHASe

LDH assays can be performed by assessing LDH released into the media as a marker of dead cells or performing lysis LDH as a marker of remaining live cells. Prepare Lactate Dehydrogenase Assay Mixture fresh for each experiment: Mix equal amounts of Lactate Dehydrogenase Assay Substrate, Assay Dye and enzyme in order to have 20 µL for each well that will be measured plus 10% extra for error. Enzyme aliquots are in the -20ºC freezer and are in 400 µL and 750 µL volumes. 400 µL is sufficient for one Plate; 750 µL is sufficient for 2 (24) well Plates. The Substrate and Dye are in the tissue culture refrigerator. The enzyme must be kept in the dark, and the reagents are added in the dark, with the hood light off.

1. In a 96 well clear Plate, fill all wells in column A with 40 µL MEM/BSA/Hepes (+/- N2 if appropriate) as blank.
2. Pipette 40 µL of each sample from your toxicity experiment in duplicate into the 96 well Plate. Using a repeater, add 20 µL of the substrate/dye/enzyme mix to each well. (Pop any bubbles with a needle/forceps)
3. Cover the Plate with a paper towel and bring it to the Plate reader outside the cold room.
4. Open the Magellan program on the desktop. Use the manual setting to shake the Plate for 5 seconds, and then store it in a dark location (inside the shelf under the laptop) for 20-30 minutes at room temperature.
5. Use the Magellan program on the Plate reader outside the cold room to measure absorbance at a wavelength of 492 nm.

Appendix IX-

ESTIMATION OF ENERGY EXPENDITURE RECORD

Name: Sex :
Age:
Occupation: Address:

Time	(Activity type)	Total time	Similar Activity	Kcal/ minute
5.00 - 5.30 a.m 5.30 – 6.00 a.m 6.00 – 6.30 a.m 6.30 – 7.00 a.m				
7.00 - 7.30 a.m 7.30 – 8.00 a.m 8.00 – 8.30 a.m 8.30 – 9.00 a.m				
9.00 - 9.30 a.m 9.30 – 10.00 a.m 10.00 – 10.30 a.m 10.30 – 11.00 a.m				
11.00 - 11.30 a.m 11.30 – 12.00 p.m 12.00 – 12.30 p.m 12.30 – 1.00 p.m				
1.00 - 1.30 p.m 2.30 – 3.00 p.m 3.00 – 3.30 p.m 3.30 – 4.00 p.m				
4.00 - 4.30 p.m 5.00 – 5.30 p.m 4.30 – 5.00 p.m 5.30 – 6.00 p.m				
6.00 – 6.30 p.m 6.30 – 7.00 p.m 7.00 – 7.30 p.m 7.30 – 8.00 p.m				
8.00 - 8.30 p.m 8.30 – 9.00 p.m 9.00 – 9.30 p.m 9.30 – 10.00 p.m				
10.00 - 10.30 p.m 10.30 – 11.00 p.m				
Daily Total				

Appendix X – Assessment of Physical Performance

1. 30-meter Acceleration Test

The objective of this test is to monitor the development of the athlete's ability to effectively and efficiently build up acceleration, from a standing start or from starting blocks, to maximum speed.

Instructions

The subject should be instructed and motivated to give an all-out effort. One experimenter should stand beside the starting line with a flag and the other beside the finishing line. The experimenter should start the stop watch on observing the down signal by the experimenter at the starting line. The subject runs the distance immediately on receiving the start Signal or ‘Start’ sound. The time for traveling the distance of 30 m is recorded. It is better to take the average of three trials.

Equipment were; 400-meter track—with a 30-meter marked section on the straight , Stop watch , An assistant.

Scoring " It is better to take three trials with a rest pause of not less than 30 min.

Scoring- Average: 4.5-5.0, Good: 4.2- 4.5

2. 60-metre Dash

This is a test for speed maintenance and development of the athlete's acceleration and pick up to full flight.

Instructions

At first the running track should be marked like the running track used in competitions standard athletic track bears these marks naturally. Mark the starting line and finishing line leaving a distance of 60 m between them. This requires two persons for execution.

The subject should be instructed and motivated to give an all-out effort. One experimenter should stand beside the starting line with a flag and the other beside the finishing line. The experimenter should start the stop watch on observing the down signal by the experimenter at the starting line. The subject runs the distance immediately on receiving the start signal or ‘Start’ sound. The time for travelling the

distance of 60 m is recorded. It is better to take average of three trials with a rest pause of at least 30 min.

Equipment; A level ground, preferably a running track (Cinder or Tartan). Same surface should be maintained for the purpose of comparison of the result.

- Stop watch
- Measuring tape
- An assistant.

Scoring Analysis of the result is by comparing it with the results of previous tests. A person running 100 m in 10.5 s is expected to run 60 m in 6.52 s.

3. Sit-Ups or Curl-ups

Sit-up test measures the strength of the abdominal muscles.

Equipment Required

- Mat placed on a flat surface
- An assistant
- A stop watch (optional).

Procedure

The person should lie on his back, with knees flexed to 90°, feet flat on the floor. The assistant should kneel next to the person's knees, and extend the forearm across the player's knees. The assistant should not apply any downward pressure that could assist the player in the movement. At the 'Go' command, the person should extend his arms in front of the body, and curl the trunk forward until the palms of the hands touch the partner's forearm. This counts as '1'. The player should then go back to the starting position.

A variation of this movement is possible where the hands are to be placed at the back of the head and the nose will touch the thigh to complete the sit-up position. The aim is to achieve the highest score possible in 1 minute. Players should not bounce from the hips or the shoulders. Movements that are not of full range should not be counted.

Scoring: 37-41 Good; 29-32 Average; 25-28 Fair

4. **Ruler Drop Test**

This is a test for simple reaction time. This test is also known as Nelson Finger Reaction Test (Nelson, 1965).

Equipment Required

- A 1-meter ruler (preferably a metal ruler or wooden ruler) , An assistant.

Instruction and Procedure

The subject sits on a chair with the forearm and hand resting on the edge of a table. He/she holds the index finger and thumb about 2 inches apart (in horizontal position) and beyond the edge of the desk. A dark black line is marked on the ruler and this is called the 'concentration zone'. The ruler is held by the assistant between the outstretched index finger and thumb of the subject, so that the top of the athlete's thumb is level with the zero-centimeter line on the ruler. The subject looks at the concentration zone. Instructs the subject to catch the ruler as soon as possible after it has been released.

The distance between the bottom of the ruler and the top of the athlete's thumb (where the ruler has been caught) is recorded.

Calculation

The equation to calculate the reaction speed is $d = vt + 1/2\ at^2$

where d= distance in metres

v = initial velocity = 0

a= acceleration due to gravity = 9.81 m/s^2

t = time in seconds.

Considering the v = 0 the equation is modified as t = Sqrt(2d/a) to give the reaction time directly from the distance value.

Normative Data: <7.5 cm Excellent; 7.5-15.9 Above average; 15.9- 20.4 cm Below Average; >28 cm Poor.

5. Margaria Kalamen Power Test

The objective of this test is to monitor the development of the athlete's power. This test is done using a standard staircase. Speed of climbing 12 steps is the criteria for anaerobic power in this test.

Instruction and Procedure

At first, the athlete's weight is determined (kg) and recorded and then the vertical distance between the 3rd and 9th steps is recorded. After whole-body stretching exercises, a few practices runs up the steps are allowed as a warm-up. The athlete stands ready at the starting line at the base of the staircase. On the command 'Start' the athlete sprints to the steps and up the flight of steps taking three steps at a time (3rd, 6th and 9th steps).

The time to get from the 3rd step to the 9th step is recorded—the stopwatch is to be started with foot contact on the 3rd step and stopped with foot contact on the 9th step.

The athlete repeats the test 2 more times—about 5-minute recovery between each test is allowed.

Equipment

- Stopwatch
- Assistant

Scoring

Anaerobic power is calculated as below:

Power (watts) is calculated from the formula:

P= (M x D) x 9.8/t

where P = Power (watts)

M = Body mass (kg)

D = Vertical distance (m)**

t = Time (s)

Normative Data: 1491- 1785 Good; 1187-1481 Average; 902- 1177 Fair

6. Standing Long Jump Test (Broad Jump)

Standing long jump, also called broad Jump, is a common test of explosive leg power. This test was an Olympic event until 1912.

Equipment Required

- Measuring tape to measure distance jumped
- Non-slip floor for takeoff, and soft-landing surface. Normally, sand pit is used as the landing surface

- A stick to mark the landing point.

Procedure

Mark a line before the landing pit Tell the athlete to stand behind the marked line with feet slightly apart. Both feet are used for take-off and landing. The swinging of drive is also allowed. Tell the subject to jump as far as possible, landing on both feet and without falling backward. Three attempts are allowed. The distance between the marked line and the landing point is the score.

Normative Data: 156 cm Above Average; 146 cm Average; 135 cm Below Average

7. Hexagon Agility Test

This is a test of the ability to move with maximum speed while maintaining balance.

Equipment Required

- Tape measure
- Chalk or tape for marking the ground
- Stop watch.

Instruction and Procedure

Mark a hexagon (six-sided shape) on the floor using a measuring tape. The length of each side should be 24 inches (61 cm), and each angle should be 120 degrees. The person to be tested starts with both feet together in the middle of the hexagon facing the front line. On the command ‘go’, he jumps ahead across the line, then back over the same line into the middle of the hexagon. Then, continuing to face forward with feet together, jump over the next side of the hexagon and back into the hexagon. This pattern is continued for three full revolutions. The test should be performed in both clockwise and anticlockwise directions. The time recording starts at ‘go’ and stops at the end of three full revolutions.

Scoring

The athlete’s score is the time taken to complete three full revolutions. The best score from two trials is recorded. Comparison of the anti-clockwise and clockwise directions will show if any imbalances exist between left and right movement skills.

Normative Data

Competitive college athlete (female): 12.9 Sec