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FAMILIARIZING THE PINE NUT OIL BY FUSING IT INTO DIFFERENT FOOD PRODUCTS

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ABSTRACT

Pinus gerardiana (Family-Pinaceae) known as the “chilgoza” which is native to the northwestern Himalayas. There are about 29 species of pine and are utilized by indigenous tribal cultures in the world. In India, out of six species of pine, Pinus gerardiana is the only species which produces edible and highly nutritious nuts. The FAO reported that the utilization of pine nuts as a comestible food item was practiced from pre-historic times to date. Its oil is of very good quality, free of cholesterol and a rich source of fatty acids like Stearic acid (0.3%), Linoleic acid (51.3 %), Linolenic acid (1.5%), Oleic acid (39.7%), Arachidic acid (2.1%), Palmitic acid (7.2%).The extraction of pine nut oil was done using oil extracting machine in locally available small-scale industry and the extracted Pine nut oil is used to cook various recipes like Veg Pulao, Green gram sandal, Cutlet and Vegetable salad and were randomly evaluated using five-point hedonic scale and the Nutritive analysis was done laboratorically. The result showed that Veg pulao, cutlet, green gram sundal and vegetable salad prepared using pine nut oil is rich in Fat (23.31gms, 16.42 gms, 15.4 gms, 7.4gms) respectively and Protein (12.7 gms, 13.2 gms, 14.8 gms, 3 gms) respectively. It is concluded that fusion of pine nut oil in the different recipes were found to be rich in all essential fatty acids, proteins, several vitamins and minerals and were acceptable among the adolescence girls. It also helps to prevent many diseases from its occurrence.

KEYWORDS: Pinus Gerardiana, Tribal culture, Edible nuts, FAO, Pre historic times, Fatty Acid, Pine Oil, Sensory Evaluation, Nutritive Analysis, Adolescence Girls.

INTRODUCTION

The first pines emerged somewhere in northern Asia around 180 million years ago. Geologically, it was Triassic Period in the Mesozoic Era (age of reptiles). Pines gradually differentiated into Haploxylon (soft or white) pines and Diploxylon (hard or yellow) pines. They are both important sources of seeds for human consumption. Humans started to utilize pine nuts in the Paleolithic era. The Food and Agriculture Organization reported the utilization

of pine nuts as a comestible food item from pre-historic times to date (Cielsa, W.M., 1998 and Zonneveld, B., 2011). Today's busy lifestyles provide an opportunity to use tree nuts as they are nutritious, handy and tasty snacks, and pine nuts are used in traditional recipes in many countries.

Pinus gerardiana, known as the chilgoza pine, (noosa, or neoza) is a pine native to the northwestern Himalayas. There are about 29 species of pine which produce edible nuts those are utilized by indigenous tribal cultures in the world. In India, out of six species of pine, Pinus gerardiana is the only species which produces edible and highly nutritious nuts. This species is distributed not only in India but also in Afghanistan, Tibet, Baluchistan (Pakistan) between 2000 and 3350 m elevation (Critchfield WB, 1966; Farjon A.,1984; 2001).

Classification of Pinus gerardiana

Kingdom: Plantae

Division: Pinophyta

Class: Pinopsida

Order: Pinales

Family: Pinaceae

Genus: Pinus

Species: Pinus gerardiana

In India, it is distributed only in Himachal Pradesh (Kinnaur and Chamba Districts) and Jammu and Kashmir. The branches are slightly ascending, and usually not whorled. The bark exfoliates in irregular thin flakes, gray in color. The leaves are needle like, stiff, dark green, and are arranged in clusters of three. Male cones are long, and female cones are oblong ovoid with thick woody scales. Seeds are cylindrical, elongated, dark brown pointed at the tip, measure and bear a rudimentary wing. Pinus gerardiana is well known for its edible seeds (Chilgoza), rich in carbohydrates and proteins.

Pinus pinea L., a major tree nut species known as stone pine, is an evergreen conifer and the largest producer of commercial pine nuts. It is endemic to the Mediterranean Basin, where the seeds have been part of the Mediterranean diet for over 20 centuries. In fact, in the last decade, the demand for pine nuts has risen due to the growing evidence of the association of tree nuts consumption to a wide range of health benefits (Estruch et al., 2006,2013).

Tree nuts can be defined as "dry fruits with generally one seed in which the overall wall becomes hard at maturity" (Alasalvar, C., et al., 2008). Aqueous enzymatic extraction has been extensively studied. It has received much interest, and viewed as an alternative method to extract oil from oil-bearing seeds. Not only this green technology is beneficial to people's health but also is environmentally friendly. (Campbell K.A, et al.,2011).

Health scientific societies and legislation agencies such as the US Food and Drug Administration (Food and Drug Administration [FDA], 2003) and the Canadian Cardiovascular Society (Anderson et al., 2013) recommend the regular consumption of nuts to the general population, in the context of a healthy diet, to prevent the risk of cardiovascular diseases. The cardio-protective constituents of pine nuts include unsaturated fatty acids, phytosterols, various tocopherols (α-, γ-, and δ-tocopherols), and squalene (Maguire, et al., 2004). While most tree nuts oils show a high content of monounsaturated fatty acids, mainly oleic acid (18:1n-9), pine nut oil exhibits a fatty acid profile in which polyunsaturated (PUFA) are more abundant, especially linoleic acid (18:2n-6) (Evaristo et al., 2010).

FIGURE-1 PINE NUT

The various bio actives contained in pine nuts also include phenolic compounds, although their content is low compared to other tree nuts. P. pinea L. trees were brought into South America by Italian and Spanish immigrants mainly, who planted them for ornamental purposes, dune stabilization, and cattle shading. (Bolling, et al., 2011). Therefore, the aim of the study is to popularize the pine nut oil among the Southern region of India and to educate the people about the importance of MUFA (Monounsaturated fatty acids), which is rich in pine nut oil and squalene (Maguire, et al., 2004). While most tree nuts oils show a high content of monounsaturated fatty acids, mainly oleic acid (18:1n-9), pine nut oil exhibits a fatty acid profile in which polyunsaturated (PUFA) are more abundant, especially linoleic acid (18:2n-6) (Evaristo et al., 2010).

MATERIALS AND METHOD

SELECTION OF SAMPLE

The Pine nut with its shell were brought from Ajfan nuts shop which is located in Ambur. The groceries were collected from local market in Vaniyambadi. The extracting of pine nut oil is extracted from oil extracting machine in locally available small-scale industry which is located in Vaniyambadi.

SAMPLE PREPARATION

SEPARATION OF SHELL OF PINE NUT

Fine quality of 1 Kg of pine nuts were brought with shells. The shells of pine nuts are broken by hands and pine nuts are separated from its shell. The process of separating the pine nuts from shells helps to extract its oil from it which has edibility.

EXTRACTION OF OIL

After the separation of nuts from its shell; the nuts are ready to extract oil from it, which is taken to a small-scale industry, there the nuts are placed in the oil extracting machine, then the oil is extracted thoroughly from its nuts. The final outcome of oil is approximately 400 ml.

SELECTION OF AREA

The Present study was carried out in Marudhar Kesari Jain College for Women, Marudhar Nagar, Chinnakallupali, Tirupattur District due to the familiarity of the consumers.

SELECTION OF SAMPLE

Totally 30 teenagers were selected under the age of 19 to 20 years old girls from Marudhar Kesari Jain College for Women, by convenient random sampling technique.

PREPARATION OF FOOD PRODUCT USING PINE NUT OIL

Pine nut oil is used to cook various recipes at various portion of oil. The recipes were Veg Pulao, Green gram sundal, Cutlet and Vegetable salad. These food products which prepared using pine nut oil were randomly evaluated by the teen girls among the age of 19 to 20 years old of Marudhar Kesari Jain College for Women, Vaniyambadi.

(A) (B) (C) (D)

FIGURE-2 A) VEGETABLE PULAO

B) GREEN GRAM SUNDAL

C) CUTLET

D) VEGETABLE SALAD

FIGURE-3 FLOW OF WORK

SENSORY EVALUATION OF FOOD PRODUCTS PREPARED USING PINE NUT OIL AMONG THE SELECTED SUBJECT

The recipes using pine nut oil were done at home, Periyapet, Vaniyambadi, Tirupattur district. Some of the recipes such as Veg Pulao, Green gram sundal, Cutlet and Vegetable salad were prepared using pine nut oil.

A five-point scoring tests was formulated, presented and used for the condition of organoleptic evaluation. This helped in finding out the acceptability of the products with regards to all recipes in Appearance, Color, Texture, Taste and Flavor.

These recipes which prepared by pine nut oil were tested and critically evaluated by the selected participants (Students) in Marudhar Kesari Jain College for Women for Appearance, Color, Texture, Taste and Flavor. Their suggestion taken into consideration and necessary modification were made to the food products.

DISTRIBUTION OF PAMPHLETS TO THE SELECTED SUBJECTS

The participants were educated on the health benefits of pine nut oil through the distribution of pamphlets, so this could be helpful for the participants to include the pine nut oil in their day-to-day food consumption.

NUTRITIVE VALUE CALCULATION OF DEVELOPED FOOD PRODUCTS

After the sensory evaluation, the developed food product was calculated by the nutritive value calculation process.

RESULTS AND DISCUSSION

SENSORY ANALYSIS OF THE FOOD PRODUCTS PREPARED USING PINE NUT OIL

Sensory evaluation of the food products prepared using pine nut oil such as Veg pulao, Cutlet, Green gram sundal, and Veg salad was carried out by 30 samples. A five-point hedonic scale was used for evaluating the attributes like Appearance, Color, Flavor, Texture and Taste.

TABLE – 1

MEAN VALUE FOR VEG PULAO PREPARED USING PINE NUT OIL

ATTRIBUTES	MEAN±SD
APPEARANCE	4.90±0.30
COLOR	4.93±0.25
FLAVOR	4.73±0.44
TEXTURE	4.80±0.40
TASTE	4.86±0.43

Above the Table – 1 shown that the mean values of Veg pulao prepared using Pine nut oil, Appearance of Veg pulao prepared using Pine nut oil has obtained (4.90±0.30) mean value. Color of Veg pulao prepared using Pine nut oil has obtained (4.93±0.25) mean value. Flavor of Veg pulao prepared using Pine nut oil has obtained (4.73±0.44) mean value. Texture of Veg pulao prepared using Pine nut oil (4.80±0.40) mean value. Taste of Veg pulao prepared using Pine nut oil has obtained (4.86±0.43) mean value.

From this above Table – 1 it can be inferred that the highest score (4.93±0.25) for Color and the least score was obtained for flavor (4.73±0.44) of the Veg pulao prepared using Pine nut oil.

FIGURE – 4

MEAN VALUE OF THE VEGETABLE PULAO USING PINE NUT OIL

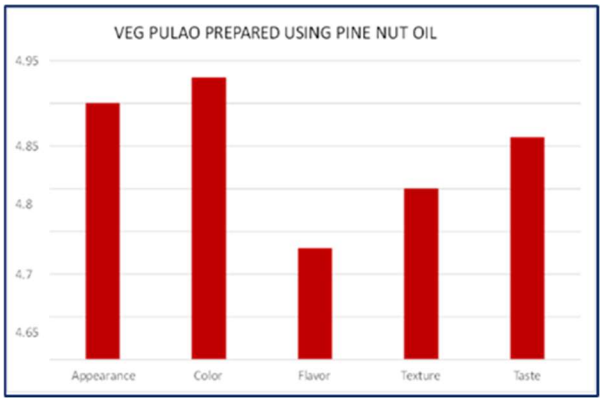


TABLE – 2

MEAN VALUE FOR CUTLET PREPARED USING PINE NUT OIL

ATTRIBUTES	MEAN±SD
APPEARANCE	4.70±0.46
COLOR	4.80±0.40
FLAVOR	4.56±0.56
TEXTURE	4.36±0.80
TASTE	4.40±0.72

Above the Table – 2 shown that the mean values of Cutlet prepared using Pine nut oil, Appearance of Cutlet prepared using Pine nut oil has obtained (4.70±0.46) mean value. Color of Cutlet prepared using Pine nut oil has obtained (4.80±0.40) mean value. Flavor of Cutlet prepared

using Pine nut oil has obtained (4.56±0.56) mean value. Texture of Cutlet prepared using Pine nut oil (4.36±0.80) mean value. Taste of Cutlet prepared using Pine nut oil has obtained (4.40±0.72) mean value.

From this above Table – 2 it can be inferred that the highest score (4.80±0.40) for Color and the least score was obtained for texture (4.36±0.80) of the Cutlet prepared using Pine nut oil.

FIGURE – 5

MEAN VALUE FOR CUTLET PREPARED USING PINE NUT OIL

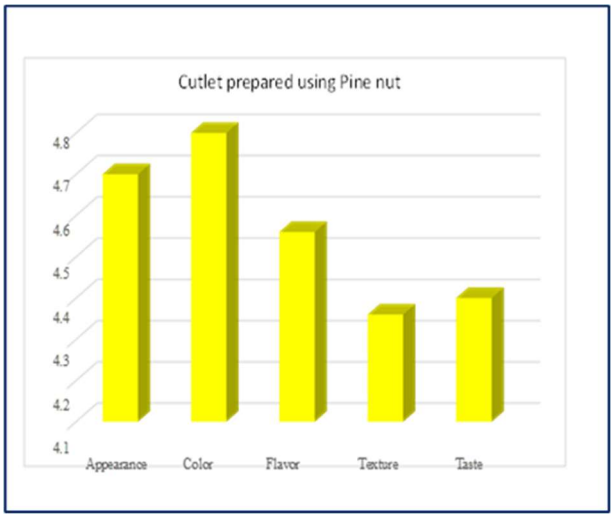


TABLE – 3

MEAN VALUE FOR GREEN GRAM SUNDAL PREPARED USING PINE NUT OIL

ATTRIBUTES	MEAN±SD
APPEARANCE	4.83±0.37
COLOR	4.76±0.43
FLAVOR	4.66±0.47
TEXTURE	4.50±0.68
TASTE	4.63±0.61

Above the Table – 3 shown that the mean values of Green gram sundal prepared using Pine nut oil, Appearance of Green gram sundal prepared using Pine nut oil has obtained (4.83±0.37) mean value. Color of Green gram.

The sundal prepared using Pine nut oil has obtained (4.76±0.43) mean value. Flavor of Green gram sundal prepared using Pine nut oil has obtained (4.66±0.47) mean value. Texture of Green gram sundal prepared using Pine nut oil (4.50±0.68) mean value. Taste of Green gram sundal prepared using Pine nut oil has obtained (4.63±0.61) mean value.

From this above Table – 3 it can be inferred that the highest score (4.83±0.37) for Color and the least score was obtained for texture (4.50±0.68) of the green gram sundal prepared using Pine nut oil.

FIGURE – 6

MEAN VALUE FOR GREEN GRAM SUNDAL PREPARED USING PINE NUT OIL

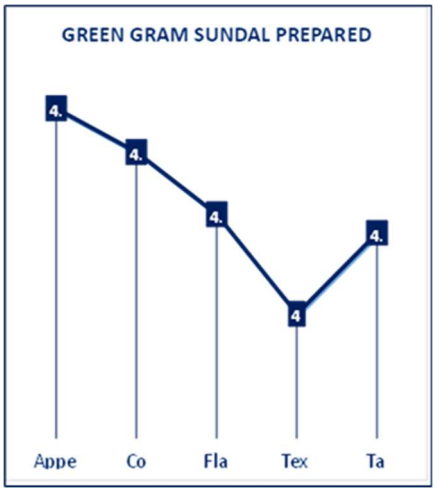


TABLE – 4

MEAN VALUE FOR VEG SALAD PREPARED USING PINE NUT OIL

ATTRIBUTES	MEAN±SD
APPEARANCE	4.80±0.40
COLOR	4.86±0.34
FLAVOR	4.40±0.89
TEXTURE	4.13±1.33
TASTE	4.10±1.44

Above the Table – 4 shown that the mean values of Veg salad prepared using Pine nut oil, Appearance of Veg salad prepared using Pine nut oil has obtained (4.80±0.40) mean value. Color of Veg salad prepared using Pine nut oil has obtained (4.86±0.34) mean value. Flavor of Veg salad prepared using Pine nut oil has obtained (4.40±0.89) mean value. Texture of Veg salad prepared using Pine nut oil (4.13±1.33) mean value. Taste of Veg salad prepared using Pine nut oil has obtained (4.10±1.44) mean value.

From this above Table – 4 it can be inferred that the highest score (4.86±0.34) for Color and the least score was obtained for taste (4.10±1.44) of the Veg salad prepared using Pine nut oil.

FIGURE – 7

MEAN VALUE FOR VEG SALAD PREPARED USING PINE NUT OIL

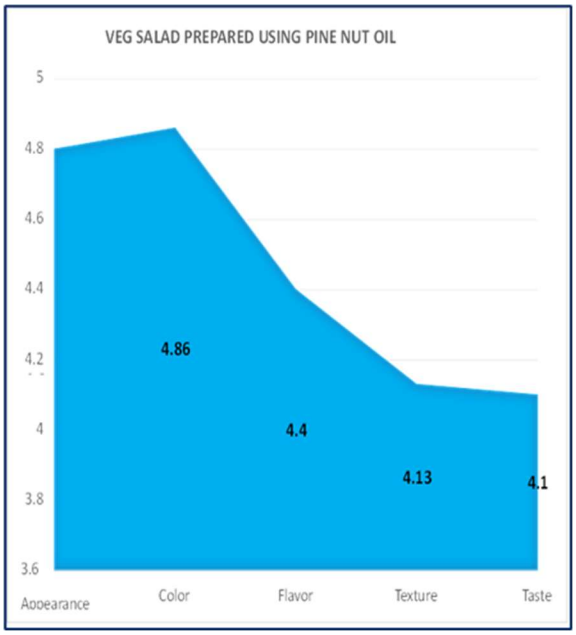
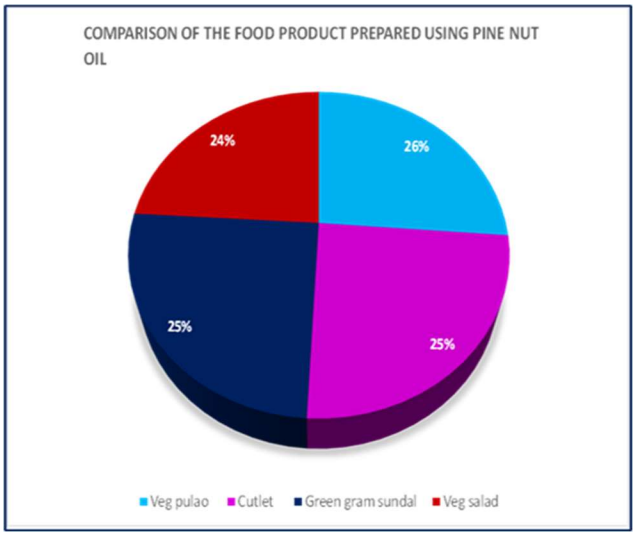


FIGURE – 8

COMPARISON OF THE FOOD PRODUCT PREPARED USING PINE NUT OIL



NUTRITIVE VALUE CALCULATION OF THE FOOD PRODUCTS PREPARED USING PINE NUT OIL

Nutritive value Calculation of the food products prepared using Pine nut oil is done under the nutrients such as Energy, Protein, Fat, Vitamin – C, Iron and β-carotene.

NUTRITIVE VALUE CALCULATION FOR VEG PULAO PREPARED USING PINE NUT OIL.

INGREDIENTS

Basmati rice – 50 grams, Carrot – 50 grams, Beans – 30 grams, Pine nut oil – 45 ml, Onion – 40 grams, Ginger – 10 grams, Garlic – 10 grams, Cabbage – 40 grams.

Ingredient	Quantity	Energy (kcal)	Protein (gms)	Fat (gms)	Vitamin - C (mgs)	β – carotene (µg)
Basmati Rice	50 gms	60	1.77	0.19	0	0
Carrot	50 gms	24	0.45	0.1	1.5	945
Beans	30 gms	47.4	2.22	0.3	8.1	10.2
Pine nut oil	45 ml	276.75	6.255	22.185	0	0
Onion	40 gms	20	0.48	0.04	4.4	0
Ginger	10 gms	6.7	0.23	0.09	0.6	4
Garlic	10 gms	14.5	0.63	0.01	1.3	0
Cabbage	40 gms	10.8	0.72	0.04	49.6	48
	Total	460.15	12.755	23.315	65.5	1007.2

TABLE-5 NUTRITIVE VALUE CALCULATION FOR VEG PULAO PREPARED USING PINE NUT OIL.

Above the table – 5 the nutritive value calculation of veg pulao prepared using pine nut oil. The nutrient content of the food product such as Energy – 460.15 kcal, Protein – 12.755 gms, Fat – 23.315 gms, Vitamin – C – 65.5 mgs, β-carotene – 1007.2 µg.

Therefore, the result shows that Veg pulao prepared using pine nut oil is rich in Fat and Protein comparing to other nutrients.

NUTRITIVE VALUE CALCULATION FOR CUTLET PREPARED USING PINE NUT OIL

INGREDIENTS:

Potatoes – 40 gms, Carrot – 30 gms, Peas – 30 gms, Pine nut oil – 30 ml, Bread crumbs – 30 gms, Corn flour – 30 gms.

TABLE – 6 NUTRITIVE VALUE CALCULATION FOR CUTLET PREPARED USING PINE NUT OIL

Ingredient	Quantity	Energy (kcal)	Protein (gms)	Fat (gms)	Vitamin - C (mgs)	β - car
Potatoes	40 gms	38.8	0.64	0.04	6.8	9.6
Carrot	30 gms	14.4	0.27	0.06	0.9	567
Peas	30 gms	27.9	2.16	0.03	2.7	24.9
Pine nut oil	30 ml	184.5	4.17	14.79	0	0
Bread crumbs	30 gms	73.2	2.64	0.42	0	0
Corn Flour	30 gms	102.6	3.33	1.08	0	27
	Total	441.4	13.21	16.42	10.4	628.5

Above the table – 6 the nutritive value calculation of Cutlet prepared using pine nut oil. The nutrient content of the food product such as Energy – 441.4 kcal, Protein – 13.21 gms, Fat – 16.42 gms, Vitamin – C –10.4 mgs, β-carotene –628.5 µg.

Therefore, the result shows that Cutlet prepared using pine nut oil is rich in Fat and Protein comparing to other nutrients.

NUTRITIVE VALUE CALCULATION FOR GREEN GRAM SUNDAL PREPARED USING PINE NUT OIL

INGREDIENTS:

Green gram dhal – 50 grams, Pine nut oil – 15 ml, Onion – 40 grams

TABLE – 7 NUTRITIVE VALUE CALCULATION FOR GREEN GRAM SUNDAL PREPARED USING PINE NUT OIL

Ingredient	Quantity	Energy (kcal)	Protein (gms)	Fat (gms)	Vitamin - C (mgs)	β - carotene (µg)
Green gram dhal	50 gms	174	12.25	0.6	0	24.5
Pine nut oil	15 ml	92.75	2.085	7.395	0	0
Onion	40 gms	20	0.48	0.04	4.4	0
	Total	286.75	14.815	15.43	4.4	24.5

Above the table – 7 the nutritive value calculation of green gram sundal prepared using pine nut oil. The nutrient content of the food product such as Energy –286.75 kcal, Protein –14.815 gms, Fat –15.43 gms, Vitamin – C – 4.4 mgs, β-carotene – 24.5 µg.

Therefore, the result shows that green gram sundal prepared using pine nut oil is rich in Protein and Fat comparing to other nutrients.

NUTRITIVE VALUE CALCULATION FOR VEG SALAD PREPARED USING PINE NUT OIL

INGEDIENTS:

Beetroot – 20 grams, Carrot – 20 grams, Cabbage – 20 grams, Pine nut oil – 15 ml.

TABLE – 8 NUTRITIVE VALUE CALCULATION FOR VEG SALAD PREPARED USING PINE NUT OIL

Ingredient	Quantity	Energy (kcal)	Protein (gms)	Fat (gms)	Vitamin - C (mgs)	Iron (mgs)	β – carotene (µg)
Beetroot	20 gms	8.6	0.34	0.02	2	0.238	0
Carrot	20 gms	9.6	0.18	0.04	0.6	0.206	378
Cabbage	20 gms	5.4	0.36	0.02	24.8	0.16	24
Pine nut oil	15 ml	92.75	2.085	7.395	0	0.54	0
	Total	116.35	2.965	7.475	27.4	1.144	402

Above the table – 8 the nutritive value calculation of veg salad prepared using pine nut oil. The nutrient content of the food product such as Energy –116.35 kcal, Protein –2.965 gms, Fat –7.475 gms, Vitamin – C – 27.4 mgs, Iron – 1.144 mgs, β-carotene –402 µg.

Therefore, the result shows that veg salad prepared using pine nut oil is rich in Fat and Protein comparing to other nutrients.

CONCLUSION

It is concluded from the study that fusion of pine nut oil in the different recipes were found to be nutritionally rich. The recipes were acceptable among the adolescence girls. Thus, the pine nut oil contains all essential fatty acids, proteins, several vitamins and minerals. It also helps to prevent from many diseases. Thus, it can be included in daily diet to enrich the nutritive value and to combat deficiency diseases.

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