An-Najah National University

Nutrition And Food Technology Department

Chemical Analysis Of Three Wild Edible Plants To Determine There Nutritional Content

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Background

❖ **Edible Wild plants:**

plant species collected in the wild to be consumed as food or drink, and have been an integral part of human diet throughout history and around the world. [1]

❖ There are many edible wild plants, widespread in Palestinian society, usually grow in the Various months of the year, and these wild edible plants are used in traditional recipes.

In this research we have highlighted three types of plants, which are:

2. Palestinian Arum

1. Gundelia

3. Asparagus

Problem?!

Lack of studies

Chemical components and nutritional value are not known precisely (For these plants & meals produced from these plants

Difficult for nutritionists include these meals within the calorie-calculated diets.

Objective

- Three Wild Edible Plants
- Chemical Analysis For Raw & Cooked Samples
- Determine These Nutritional Content & Calories
- Combine The Results After Converting Them Into A Serving In The Exchange List

Materials


Gundelia tournefortii, عكوب (كعوب)

Part Used: Leaves/Stem


Asparagus Officinalis, هليون

Part Used: Stem

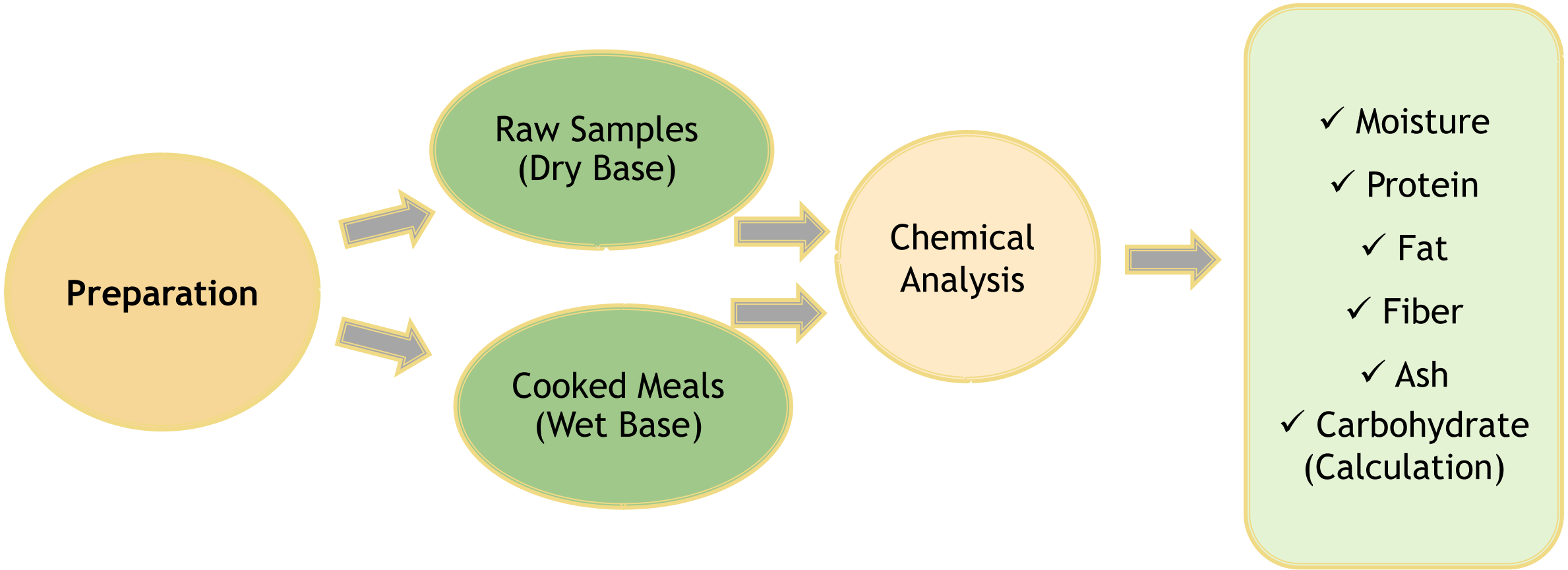

Arum palaestinum, لوف فلسطيني

Part Used: Leaves

Samples of these edible wild plants were collected from different regions in Tulkarm During its growing season, particularly during February

Methods

Part 1



Cont.

A) Raw Plants (Dry Base)

Plant Preparation:

1. Wash
2. Chopping
3. To Oven (105 C°16 hours)
4. Grinding
5. Powder

Akoob | Luff | Asparagus

Plants after washing and chopping, Akoob, Luff, Asparagus, respectively

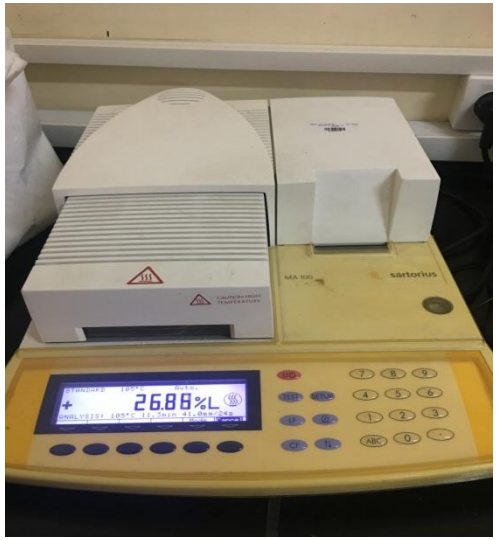
Plants after drying in oven

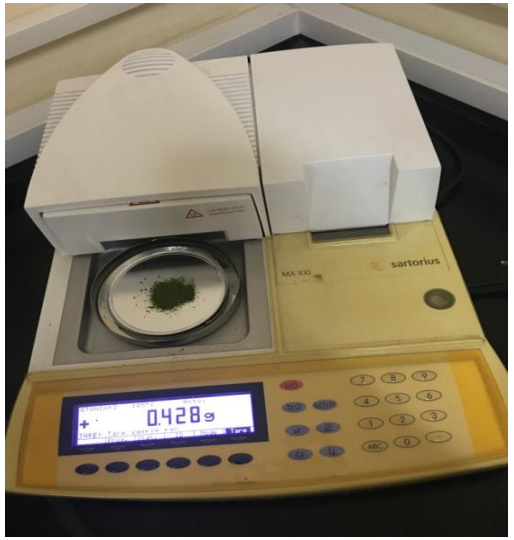
Plants after grinding (Powder)

Cont.

1. Moisture Analysis

1. • Powder
2. • Moisture Analyzer (machine)
3. • Record the results





Sartorius Moisture Analyzer, Models MA100 | MA50, Electronic Moisture Analyzer

Cont.

2. Protein Analysis

1. Powder
2. Put in filter paper
3. Weight (sample)
4. Kjeldahl Method
5. Record volume of HCl that we needed to get to the end point
6. Calculation by equations

Equations to calculate Nitrogen and Protein Percentage:

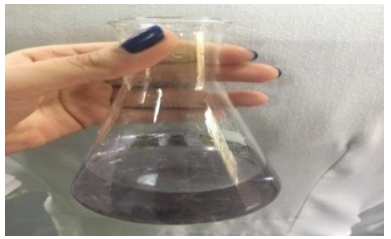
$$\text{Nitrogen} = \frac{\text{N of HCl} * (\text{Volume HCl (ml)} - \text{ml Blank}) * 1.4007}{\text{Weight of sample}}$$

$$\text{Protein} = \text{Nitrogen} * 6.25$$

Digestion

Distillation

Titration with HCl



Cont.

3. Crude Fat Analysis

❖ Depending on classic method, AOAC crude fat extraction by ether, (AOAC Official Method 991.36, Solvent Extraction Method)

Cont.

4. Crude Fiber Analysis

1. Powder
2. Put In Bag
3. Sealing
4. Weight
5. To Fiber Extraction (machine)
6. Weight after drying by oven (105 C°, 10 mints), and record the results
7. Weight the empty crucibles
8. Put Bag s in weighted crucibles
9. To Muffle Furnace (machine), (600 C °, 2hours)
10. Cooling at room Temp. then weight

$$\% \text{ Crude Fiber} = \frac{100 \times (W_3 - (W_1 \times C_1))}{W_2}$$

Where:

- W_1 = Bag tare weight
- W_2 = Sample weight
- W_3 = Weight of Organic Matter (loss of weight on ignition of bag and fiber)
- C_1 = Ash corrected blank bag factor (running average of loss of weight on ignition of blank bag / original blank bag)

A 2000 FIBER ANALYZER, ANKOM 200, Crude Fiber (AOCS Ba 6a-05), ADF, NDF

The bags we used, after putting the powder samples in it and sealing it

Cont.

5. Ash Analysis

1. Powder
2. Put In crucible
3. Weight
4. To Muffle Furnace (machine),
   (600 C °, 2hours)
5. Cooling at room temperature
6. Weight

Equations to calculate Ash Percentage:

$$\text{Ash\%} = \frac{\text{Weight of sample After}}{\text{Weight of sample Before}} * 100\%$$

Carbolite ELF 11/14B
Economy Chamber Furnace

Crucibles that we used

Cont.

5. Carbohydrate Determination

❖ Total and true carbohydrates percentage is determined By: **Calculation**

Total Carbohydrate % =	• **100% - (Protein % + Fat % + Ash % + Moisture %)**
True Carbohydrates %=	• **Total Carbohydrate % - Fiber %**

Cont.

B) Cooked (Wet Base)

Meals Preparation:

- We cooked the frozen products based on the recipes popular with Palestinian society (Traditional Food)
- One recipe was chosen for each product.
- We used house hold measurements to estimate quantities.

Akoob cooking recipe

2 Cup Akoob
½ Cup Onion
2 tbsp Olive Oil
2 g salt
2 g Black Pepper

Luff cooking recipe

1 1/3 Cup Luff
½ Cup Onion
½ Cup Tomato
2 tbsp Olive Oil
2 g salt
2 g Black Pepper

Asparagus cooking recipe

1 Cup Asparagus
2 Eggs
3 tbsp Olive Oil
2 g salt

Cont.

Akoob Meal

Luff Meal

Asparagus Meal

Blending all cooked samples

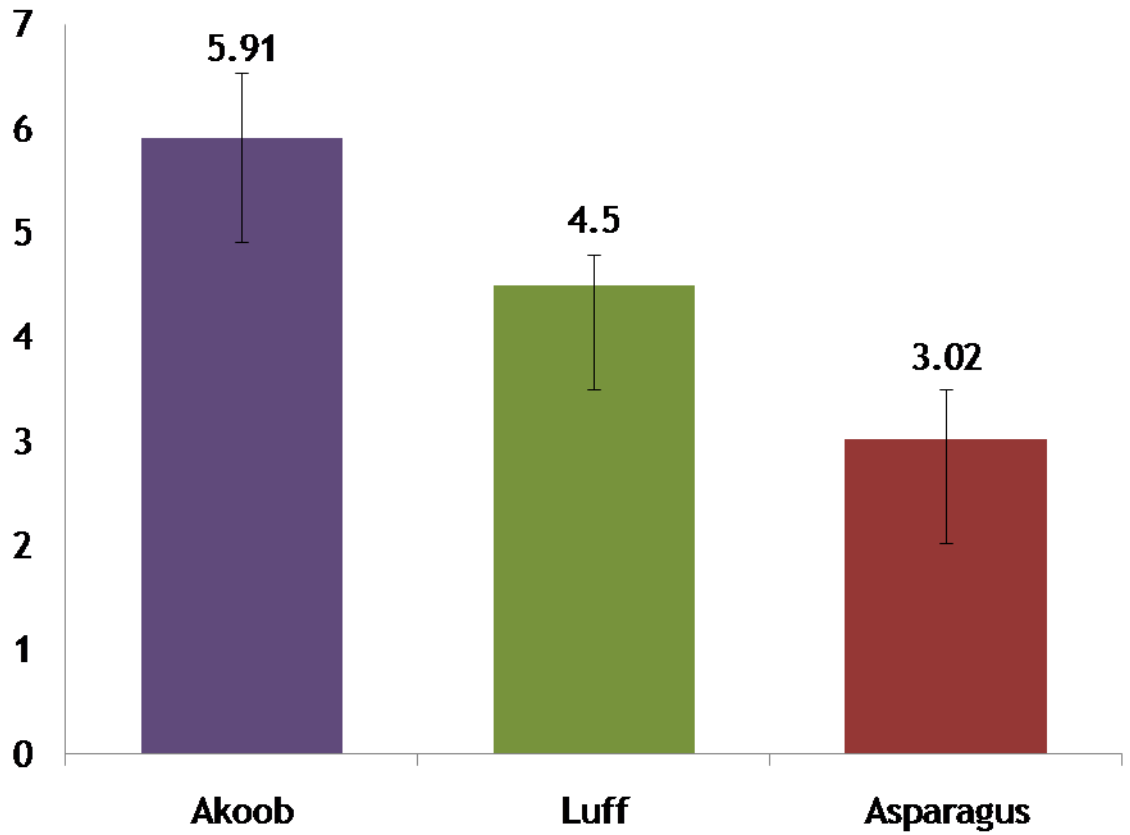
Chemical Analysis

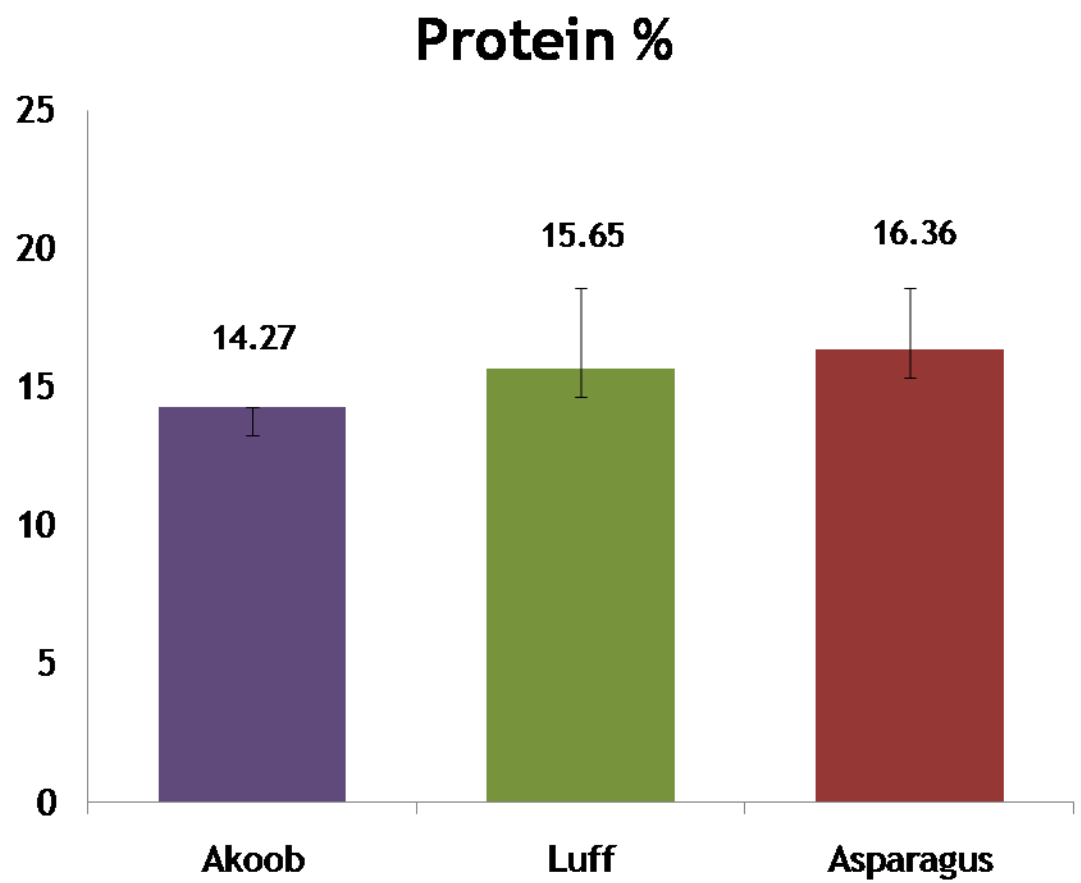
Make all chemical analysis we mentioned in the raw sample, with the same procedures

RESULTS

- Of Chemical Analysis -

Raw Samples (Dry Base)





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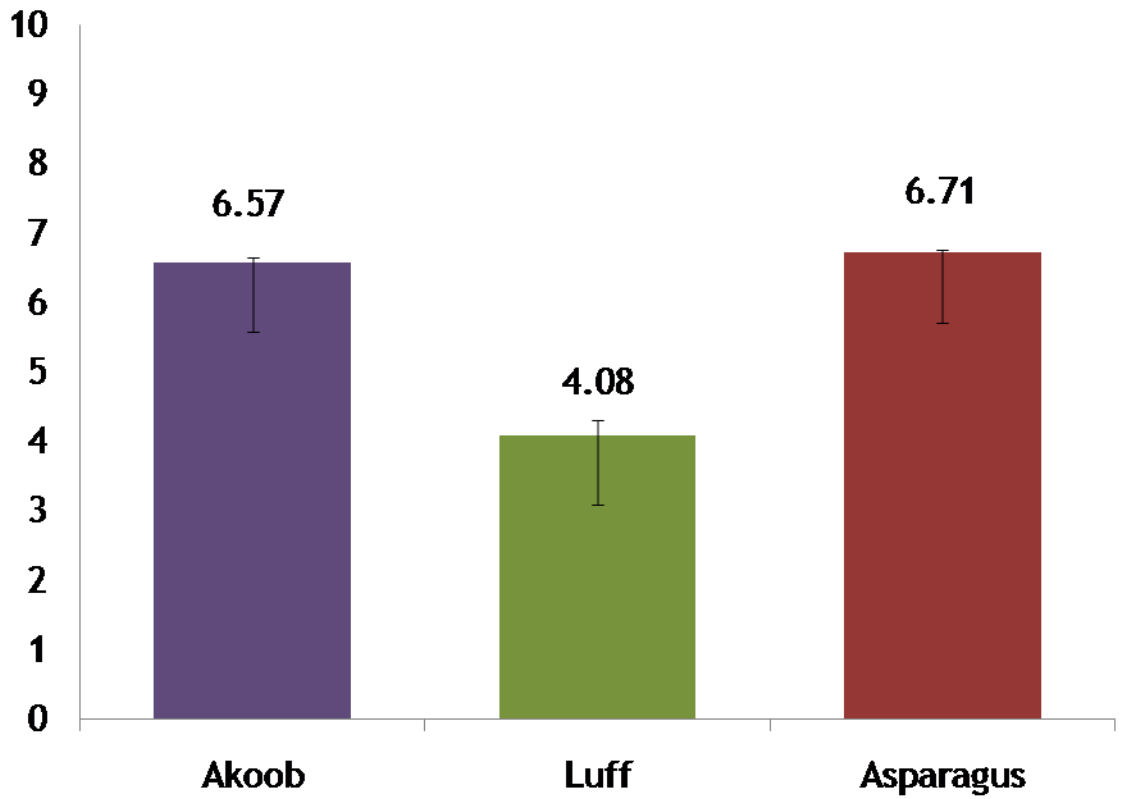
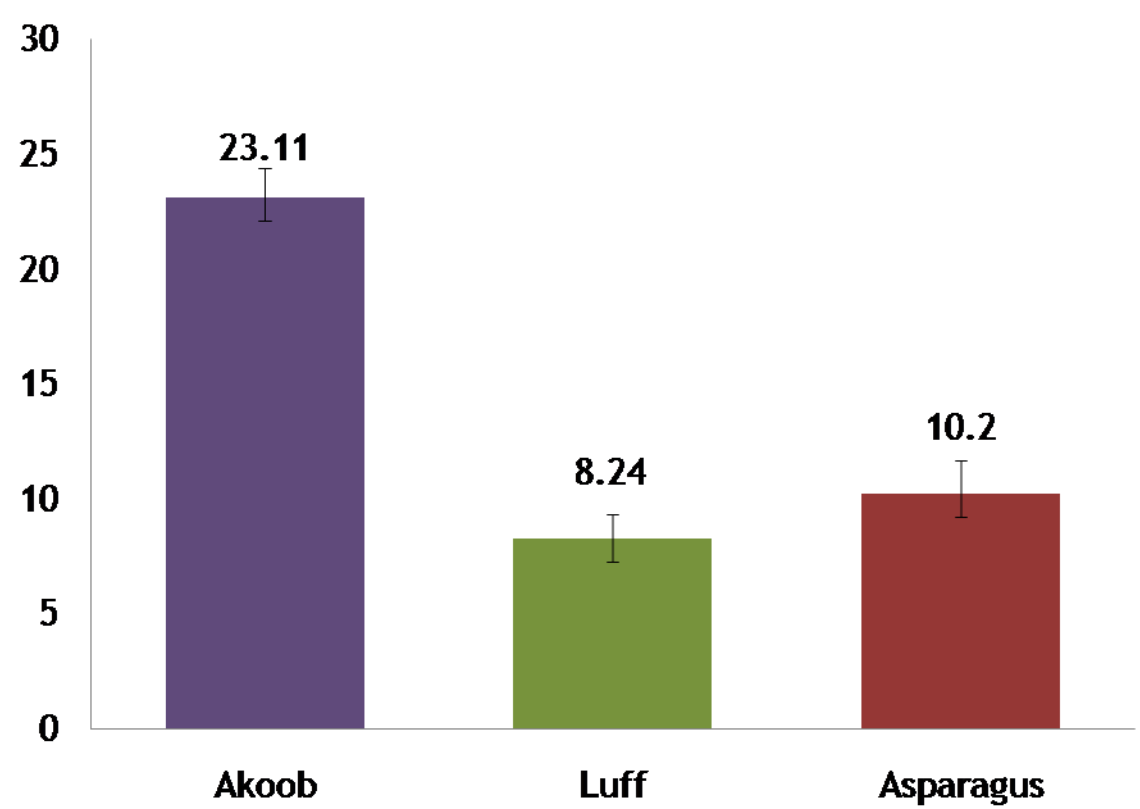
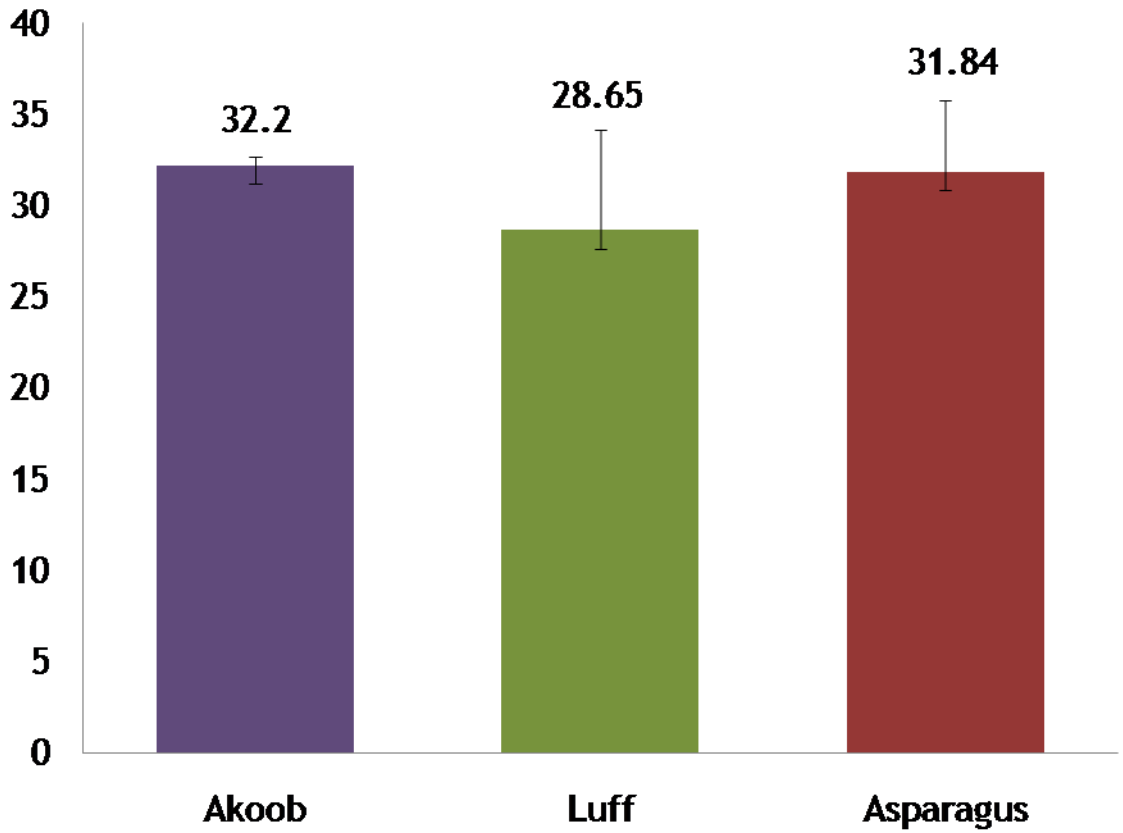
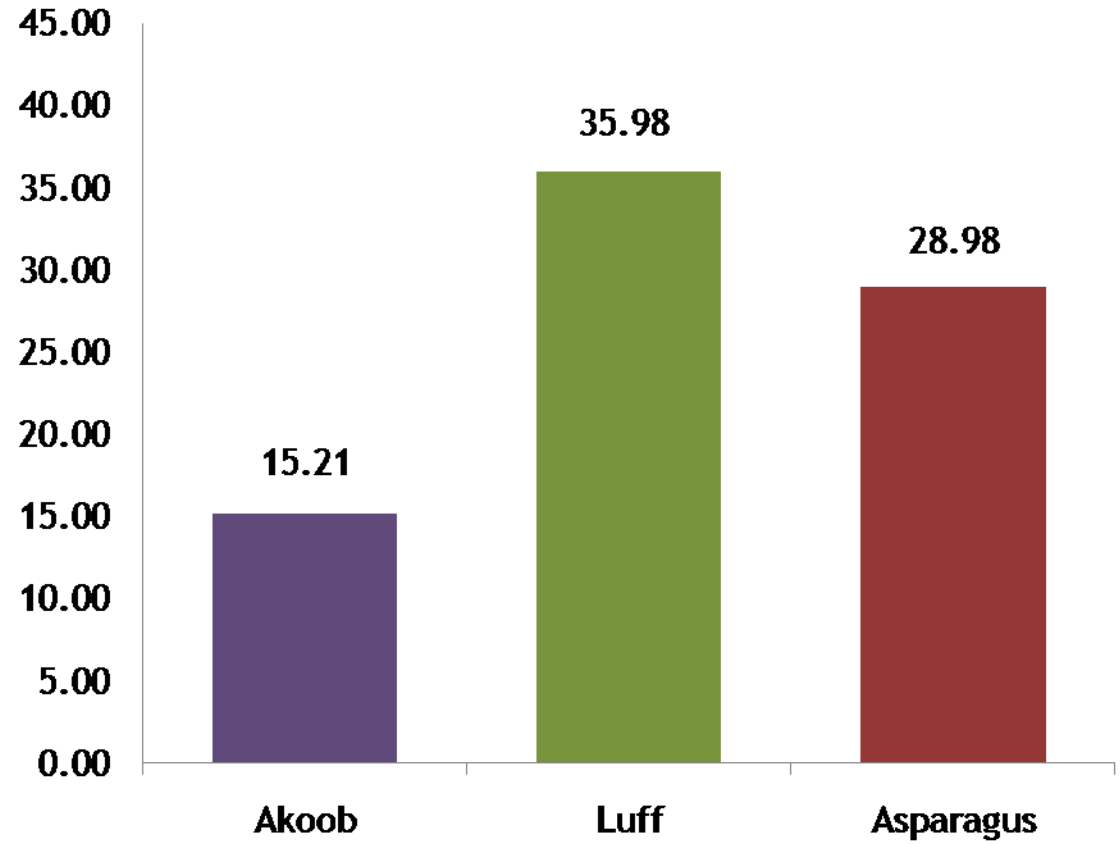

Fat %
10
9
8
7
6
5
4
3
2
1
0
6.57
4.08
6.71
Akoob
Luff
Asparagus

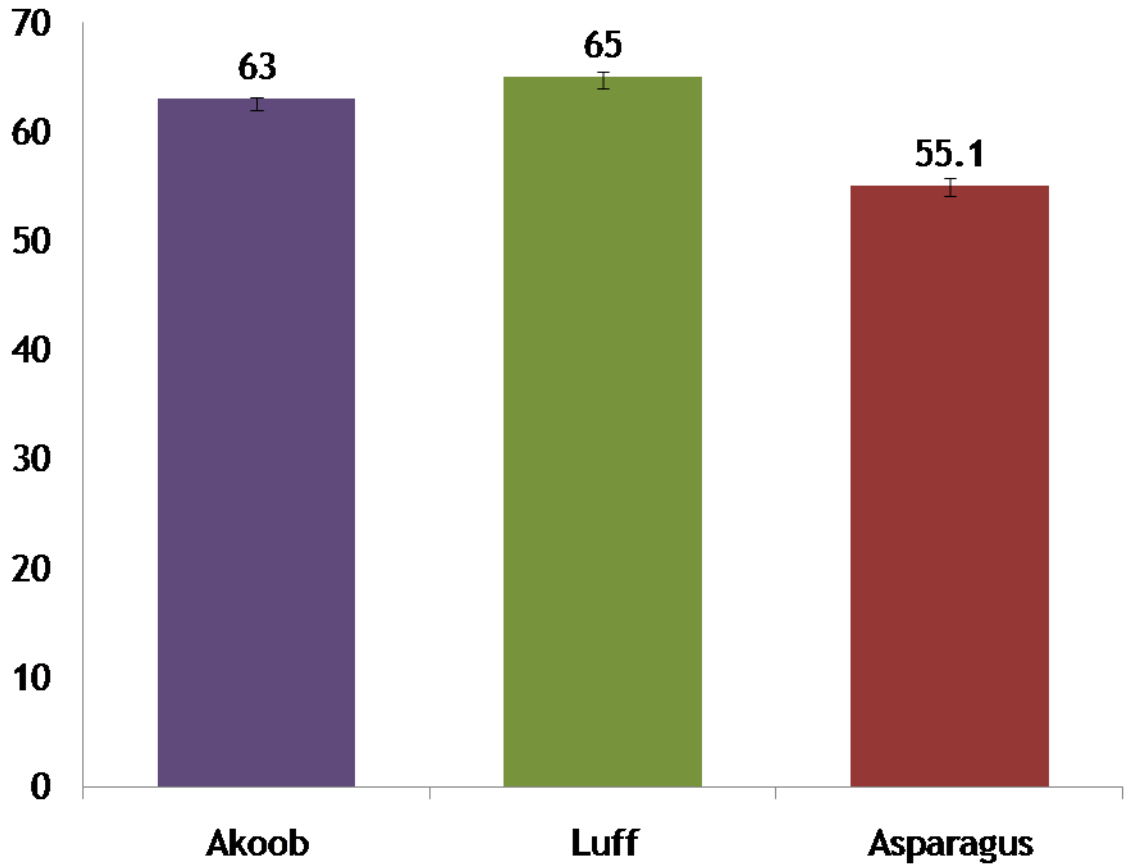

Ash %
30
25
20
15
10
5
0
23.11
8.24
10.2
Akoob
Luff
Asparagus

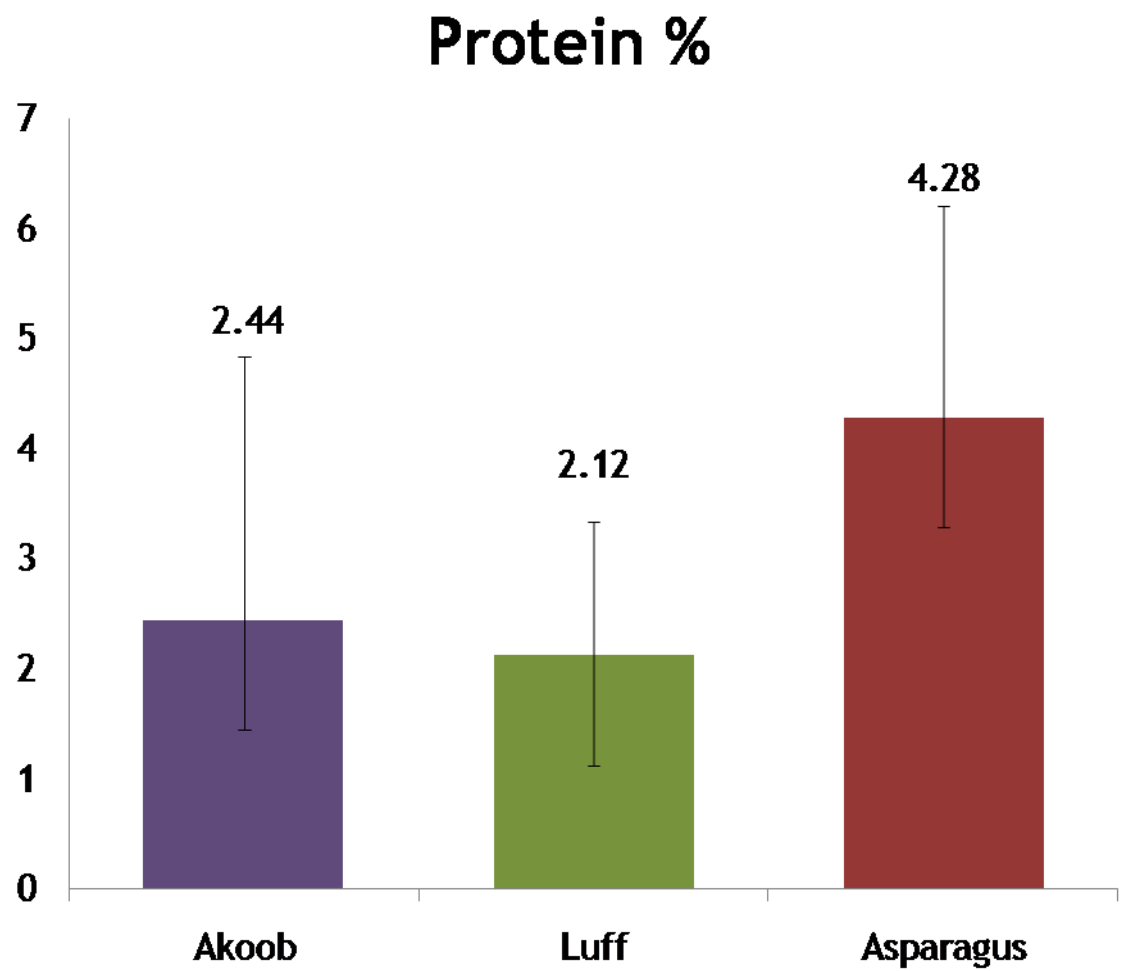
Cont.


Fiber %
40
35
30
25
20
15
10
5
0
32.2
28.65
31.84
Akoob
Luff
Asparagus


True Carbohydrate %
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
15.21
35.98
28.98
Akoob
Luff
Asparagus

Cooked Samples (Wet Base)





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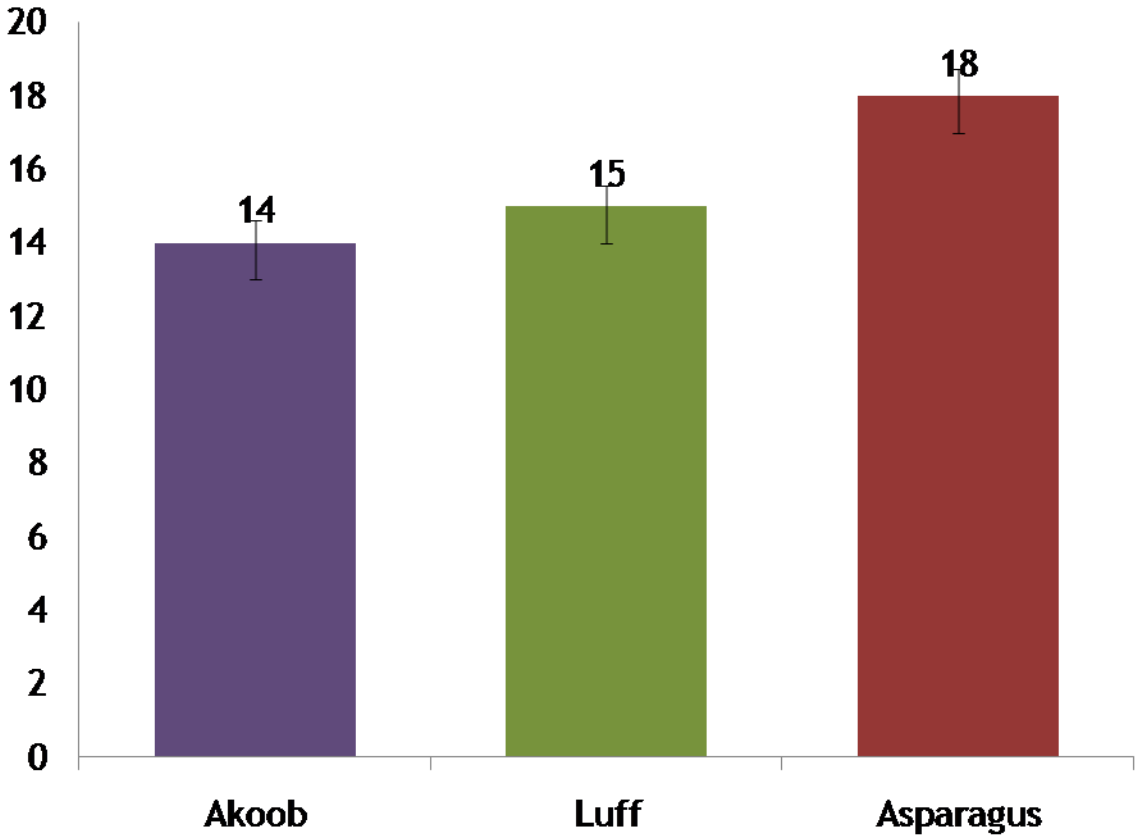
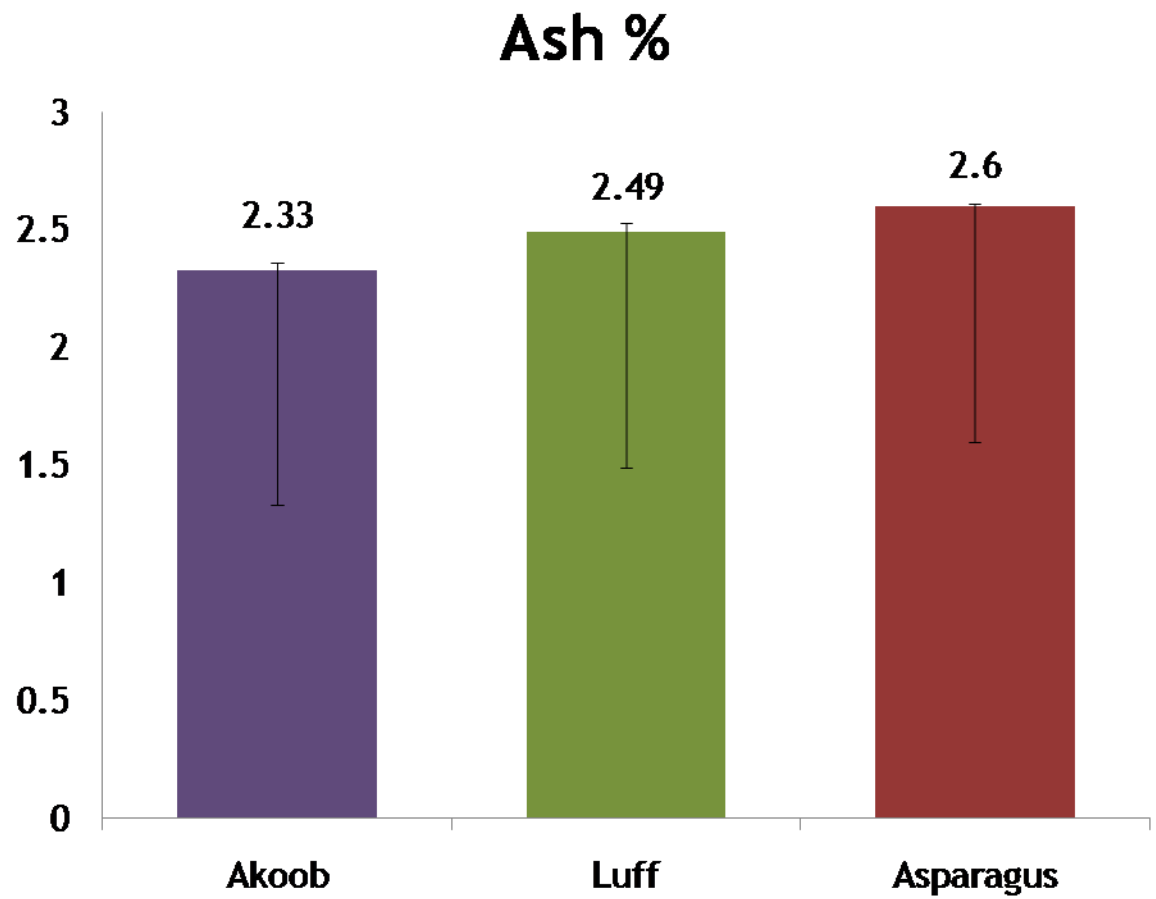
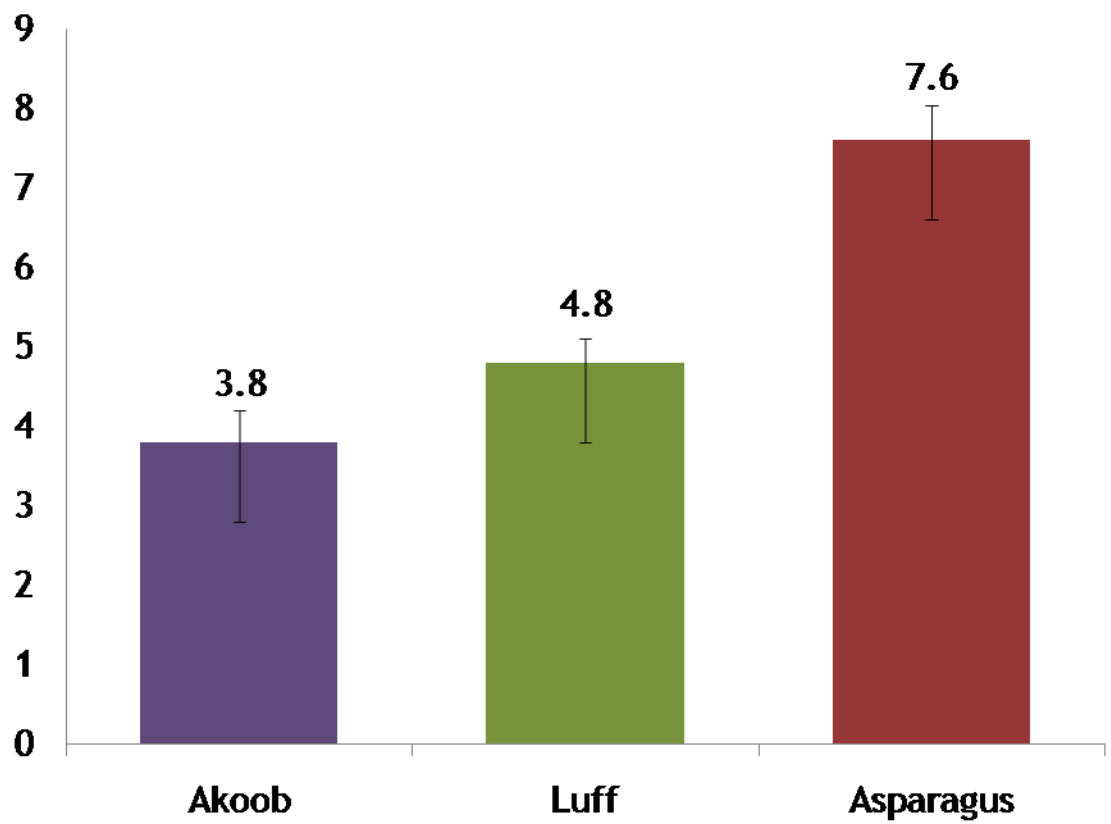
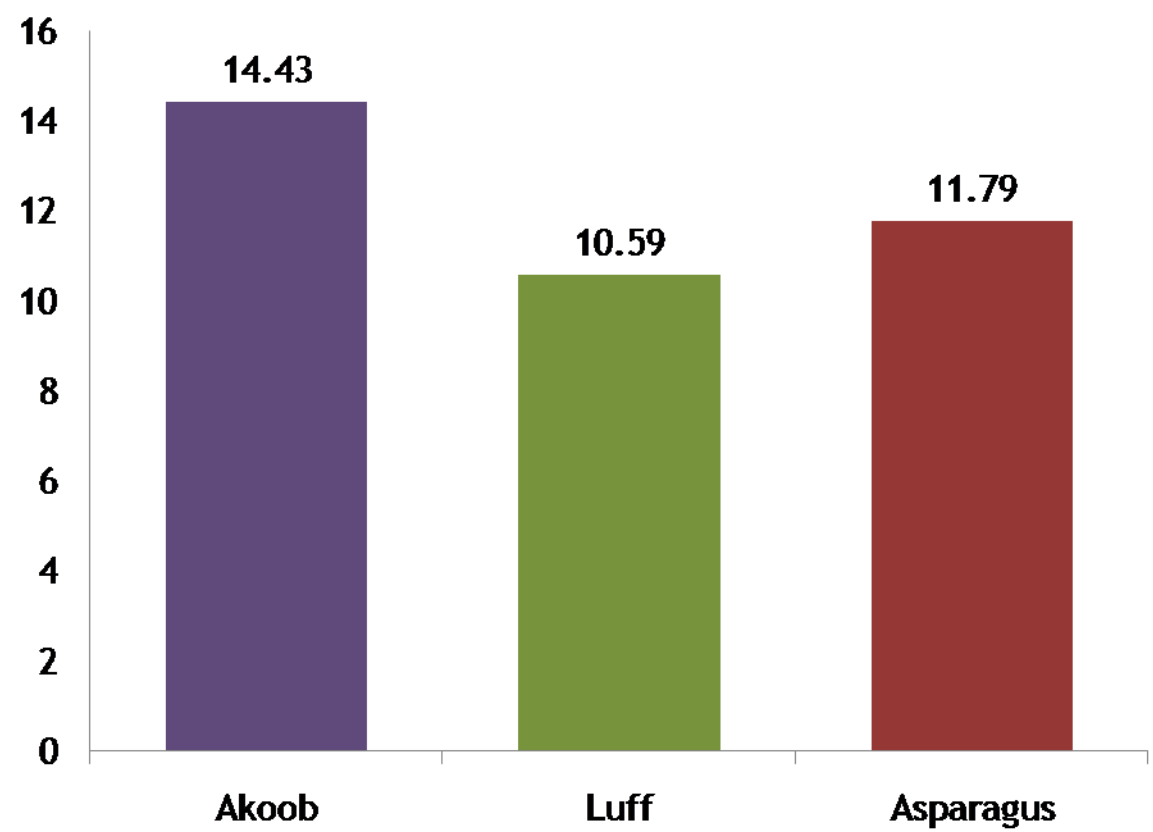

Fat %
20
18
16
14
12
10
8
6
4
2
0
14
15
18
Akoob
Luff
Asparagus


Ash %
3
2.5
2
1.5
1
0.5
0
2.33
2.49
2.6
Akoob
Luff
Asparagus

Cont.


Fiber %
9
8
7
6
5
4
3
2
1
0
3.8
4.8
7.6
Akoob
Luff
Asparagus


True Carbohydrate %
16
14
12
10
8
6
4
2
0
14.43
10.59
11.79
Akoob
Luff
Asparagus

Part 2

Food exchange System

Food Exchange List Include:

1. A Group Of Carbohydrates

- *Starches*
- *Fruits*
- *Vegetables*
- *Other Carbohydrates*

2. A Group Of Meat & Their Alternatives

- *Meat Very Low In Fat*
- *Meat Low In Fat*
- *Meats Medium In Fat*
- *Meat High In Fat*

3. A Group Of Fats

- *Saturated Fats*
- *Mono Un Saturates Fats*
- *Poly Un Saturated Fats*

Methods

Steps To Convert Results From Chemical Analysis Of Cooked Meals To Servings:

1

Determine the size of dietary alternative

1 Cup of akoob meal = 185g

1 cup of luff meal = 146g

1 cup of asparagus meal = 180g

2

Convert the amount of protein, fat & carbohydrate, from g/100g of meal weight, to g/grams certified meal weight (Size of dietary alternative)

3

Distribution to servings (Vegetables, Fats, Other Carbohydrates,…), based on the resulting numbers, and starting with the basic ingredients for each meal

Results

-Based On The Above Recipes-

1 Cup Of Akoob Meal (185g)

Contain:

- 2 Servings Of Vegetables
- 1 ½ Servings Of Other Carbohydrates, Contain (½g Protein & 1g Fat)
- 5 Servings Of Fat
- 358 Kcal

1 Cup Of Luff Meal (146g)

Contain:

- 1 ½ Servings Of Vegetables
- 1 Servings Of Other Carbohydrate, Contain (0g Protein & 2g Fat)
- 4 Servings Of Fat
- 271 Kcal

1 Cup Of Asparagus Meal (180g)

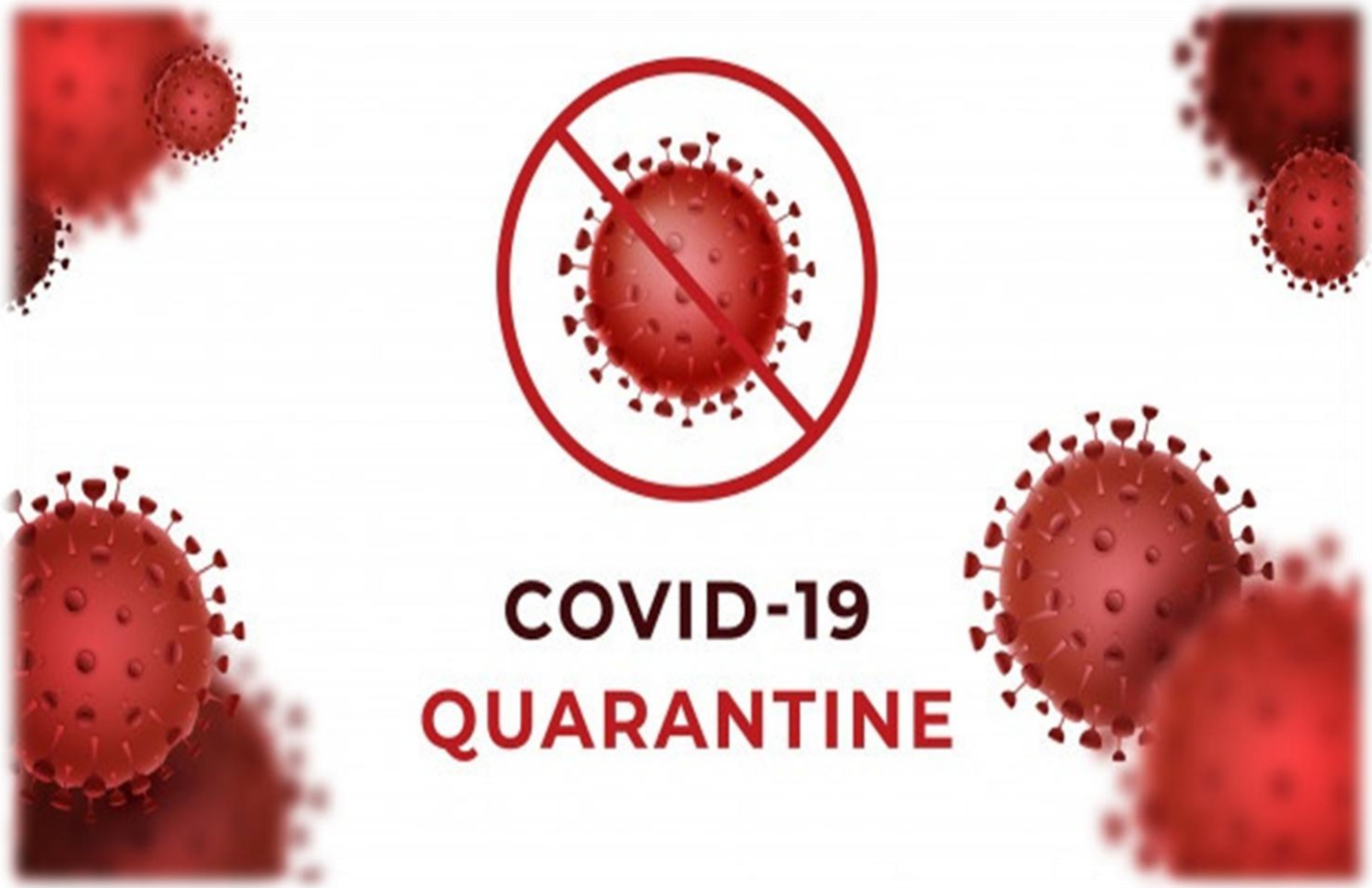
Contain:

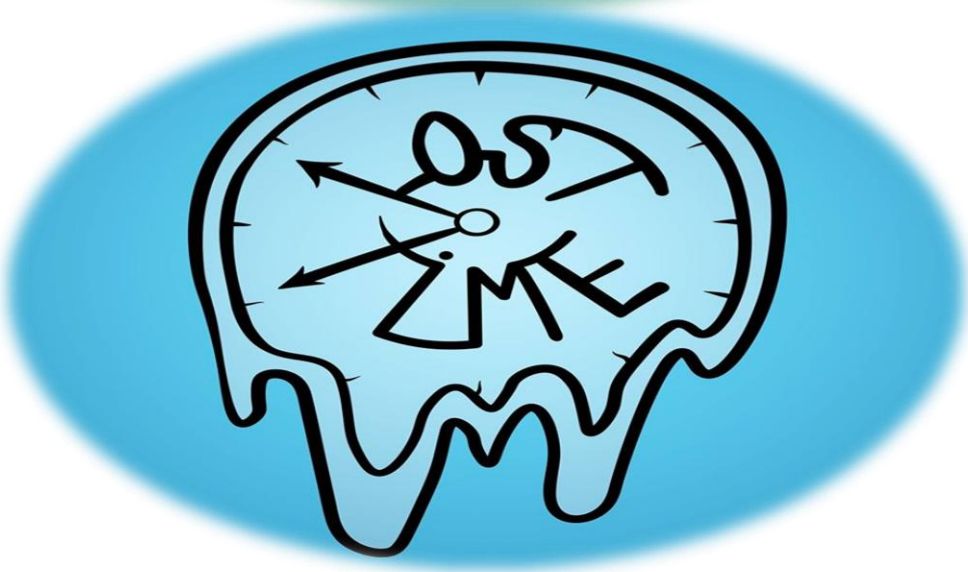
- 4 Servings Of Vegetables
- 1 Servings Of Other Carbohydrates, Contain (0g Protein, 2g Fat)
- 6 Servings Of Fat
- 407 Kca

Conclusion

The results of the chemical analysis Showed that these plants and meals prepared from them contain a good source of nutrients important for health. And these meals (Traditional Food) gives a kind of integrated food, as it includes servings of carbohydrates, vegetables & fats. These wild plant species could serve as good and cheap food sources in human diet.

Limitations

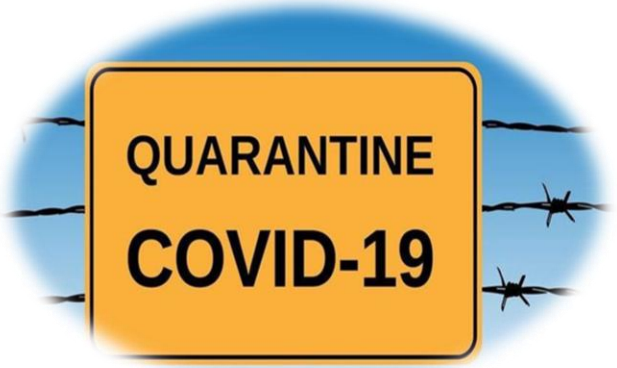




Challenges

To Do list

- [x] Samples Collected
- [x] All Chemical Analysis For Raw Samples
- [x] All Chemical Analysis For Cooked Samples
- [ ] Vitamin A & Minerals Analysis
- [ ] Fat Profile



Recommendation

References

[1] V.Reyes-Garcia, Et Al, 2015, From famine foods to delicatessen: Interpreting trends in the use of wild edible plants through cultural ecosystem services, Ecological Econmics, Volume 120, Pages 303-311.

[2] H.A.Bawadi, Et Al, 2009, Exchange Lists For Commonly-Consumed Food In Jordan & The Arab Countries.