Detoxification from Cotyledons of Apricot Seeds (*Prunus armeniaca*) and its Effect on the Properties of Raw Material and Extracted Oil

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ABSTRACT

Detoxification from seed cotyledons of (*Prunus armeniaca*) was carried out by soaking of seed cotyledons in water before and after extraction of oil, and the results showed that seed represent (15) % of fruit weight, where hull and cotyledons weight percentages were (62.19) % and (37.81) % of the mature seed respectively. The seed cotyledons contained high level of crude oil (50.93) % and medium level of protein (30.03) % and low level of carbohydrate (12.70) % also very low percentage of the ash and fibers. On the other hand, the seed cotyledons contained high level of hydrocyanic acid (0.27) %. The percentages of free fatty acids in the extractable crude oils before and after removing of the toxicity were (0.81) % and (1.69) %, respectively. The predominant fatty acids found in the crude oil were oleic, linoleic and palmatic acids and the percentage of unsaturated fatty acids reached (94) % from total fatty acids. The oil separated into eight components using thin layer chromatography, in which the tri-ethyl glycerol was the main component. The crude protein and ash content of powder was reduced after removal of the toxicity by soaking in water. The percentages of hydrocyanic acid before and after extracting oil between (2.30-3.37) % of the total hydrocyanic acid in the powder. The effect of removing of the toxicity on mineral and amino acid content of powder was relatively low especially after toxicity removing before oil extract. However, the powder was found to have most of the essential amino acids.

Keywords: Detoxification, Cotyledons of Apricot Seeds (*Prunus armeniaca*).

إزالة السمية من فلق بذور المشمش (*Prunus armeniaca*) وتأثير ذلك على خواص المادة الأولية والزيت المستخلص

الخلاصـــة:

أزيلت السمية من فلق بذور المشمش وذلك بنقع الفلق في الماء قبل وبعد استخلاص الزيت، وأوضحت النتائج أن بذور المشمش تمثل حوالي (15)% من وزن الثمار وتصل نسبة القشور والفلق إلى (62.19)% و (37.81)% على التوالي من البذرة الناضجة. أحتوى الفلق على نسبة مرتفعة من

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الزيت الخام (50.93)% ومتوسطة من البروتين الخام (30.03)% ومنخفضة من الكاربوهيدرات (12.70)% بالاضافة الى نسب قليلة جدا من الرماد والالياف، ومن ناحية أخرى أحتوى الفلق مزال الزيت على حامض الهيدروسيانيك بنسبة عالية بلغت (0.27)% وكانت نسبة الأحماض الدهنية الحرة في الزيت الخام (0.81 و 1.69)% قبل وبعد الإزالة على التوالي, وكانت الأحماض الدهنية الشائعة في الزيت هي الأوليك و اللينوليك و البالمتيك كما وصلت نسبة الأحماض الدهنية غير المشبعة إلى حوالي (94)% من مجموع الاحماض الدهنية الكلية, وتم فصل الزيت إلى ثمانية مكونات باستخدام كروماتوكرافيا الطبقة الرقيقة وكان ثلاثي أسيل الكيلسيرول هو المكون الرئيسي. محتوى البروتين الخام والالياف في الدقيق اختزلت بازالة السمية بعد عملية النقع بالماء. نسبة حامض الهيدروسيانيك قبل وبعد استخلاص الزيت شكلت ما بين (2.30 – 3.37)% من محتواه الكلي في الدقيق. وكان تأثير إزالة السمية على محتوى الدقيق من العناصر المعدنية والأحماض الامينية قليل نسبيا خاصة عند الإزالة قبل استخلاص الزيت، وقد احتوى الدقيق على اغلب الأحماض الامينية الأساسية.

INTRODUCTION:

The cotyledons of apricot seeds are from the non-conventional sources to production of oil enters in the food industry and the output powder after oil extraction is a concentrates protein can be used to Increase the nutritional value of poor foods in protein content [1]. Cotyledons oil of the apricot seeds is, golden light and content of higher unsaturated fatty acids is similar with some of other food oils, in its physical and other chemical properties [2], which oil contains on the fatty acids key is oleic, linoleic and palmitic, and a tri ethyl glycerol which is the main component of the lipids parts [3, 4]. It also has using in other non-food industrial such as cosmetics industry [5]. by powder cotyledons of apricot seeds was characterized by containing a high percentage of protein ranging between (48-56%) and is rich in its content of important metal elements and that the protein balance in content of most of the essential amino acids [6]. Another study indicated that cotyledons seeds is content to of sugars, represented by three major sugars: Monoz (50%), glucose (37.5%) and claekoronic acid (12.5)% [7], and enter in the composition of Sainugenic Claicosade, it's the most important Amygdaline which limits the use of cotyledons seeds in nutrition, as it results in hydrolysis of hydrocyanic acid which is toxic of both humans and animals at a concentration of (2-4) mg cyanide per kilogram of body weight [8, 9]. The percentage of Amygdaline in cotyledons of apricot seeds to (5.16)%, while the hydrocyanic acid up to (0.32)% [6, 10, 11], and the toxicity of the cotyledons of apricots seeds can be remove by the enzyme hydrolysis of Amygdaline by soaking cracked the seeds in water for a period of (24) hours at room temperature or for a period of (12) hour at a temperature of (40) ^{o}C where Amygdaline was analyses by Emulsin enzyme in the cotyledons seeds [12], as there are other ways to remove the toxicity was analyzed of Amygdaline by using fungi and yeasts [13].

The aim of this study is to determine the best way to remove the toxicity of cotyledons of apricot seeds before or after extraction of oil and the enzyme hydrolysis of Amygdaline that contains hydrocyanic acid causes toxicity while maintaining the physical properties and chemical composition and other components of the minerals

and amino acids for powder cotyledons seeds removed toxic as well as maintain the properties of oil extracted.

EXPERIMENTAL:

Raw Materials:

Apricot fruits, known in Latin (*Prunus armeniaca*), it's belonged the class of *Magnoliopsida* or *Dicotyledons*, are obtained from the local markets in Iraq. Were separated seeds from fruits, then washed seeds and dried in the air for two weeks, were broken manually and collect, characterized taste bitter, grinding part by laboratory mill and burden in polyethylene bags and stored at a temperature of (- 18) C° until analysis and extract the oil.

Instruments:

1- Atomic Absorption Spectrophotometer (Perkin- Elmer 5000).
2- Flame Photometer Detector (FPD) (Perkin- Elmer XL).
3- Amino Acid Analyzer (Beckman 119 CL).
4- Gas Chromatography (GC/MS) (Perkin- Elmer XL).

Technical and Analytical Methods:

Detoxification:

Detoxification process has cotyledons of apricot seeds, after conducting a self-enzyme hydrolysis of the Amygdaline by Emulsin enzyme located cotyledons seeds to produce hydrocyanic acid, which is Causative to toxicity, has been the process of detoxification in two methods, as follows: -

- Detoxification of the Full Split Seeds before Oil Extraction:

The full apricots seeds (without grinding) are soaked and cracked in the amount of water by (1:12 w / v) at a temperature of (47) °C for a period of (30) hour with the change of water every two hours, and after detoxification was removed the water from cotyledons seeds and drying in the oven at a temperature of (50) °C for (12) hours, and were then cotyledons apricot seeds grinding to remove toxicity by laboratory mill and then conducted the process of extracted oil by ether (40-60) °C. The powder of cotyledons apricot seeds removal toxicity and oil has been filled in glass bottles and save them to closed well at temperature of (- 18) °C to conduct the necessary analyzes [8].

- Detoxification from Crushed Split Seeds after Oil Extraction:

In this method have been crude crushed cotyledons seeds into small pieces and then extracts the oil from crushed cotyledons seeds by ether (40-60) °C and eliminate the effects of the solvent remaining. After that, the crushed and oil removed grains are socked in the amount of water (1: 5 w / v) and incubation at temperature of (60) °C for (6) hours with mixing and changing the water every (30) minutes to increase the rate of detoxification of crushed cotyledons seeds and then filtering to remove the water and drying in the oven at a temperature of (120) °C for a period of two hours.

Cotyledons seeds crushed, removed oil and toxic were dried and packed in glass bottles and save them to the closed well at temperature of (- 18) ºC to conduct the necessary analyzes [11].

Physical Properties of Seeds:

The weight and size of seeds were estimated and the proportion of cotyledons and the outer casing (peel) and specific weight calculate according to the method of [8].

Approximate Chemical Composition and Mineral Elements:

Moisture content, crude protein (6.25× N), crude oil, total ash and crude fiber were Measure according to the method [14]. The estimated metal elements (copper, calcium, iron, magnesium, manganese and zinc) by Atomic Absorption Spectrophotometer (Perkin Elmer 5000) and the amount of sodium and potassium using Flame Photometer Detector (FPD) (Perkin Elmer XL), and the ammonium molbaide color method is used to estimate phosphorus and measuring the intensity of blue color at a wavelength (625) nm [14].

Estimation of Hydrocyanic Acid:

As much hydrocyanic acid in powder of cotyledons of apricot seeds, according to the method [14], after conducting enzyme hydrolysis of Amygdaline located in cotyledons seeds, where they were incubated sample (10) gm in a Caldahl beaker (800) ml with (200) ml of distilled water for (6) hours, then steam distillation was carried out to soaked powder of cotyledons the apricot seeds and collect (150) ml in a beaker containing distillate (20) ml of a solution of sodium hydroxide concentration (2.5)% and then reduced to the size of distillate (250) ml. Taking (100) ml of distillate are diluted former prepared and added to it (8) ml ammonium hydroxide concentration (6) N standard and then added (2) ml of a solution of potassium iodide (5)%, with a good shake and calibration of the resulting solution by silver nitrate solution (0.02) N and then calculate the milligrams of hydrocyanic acid according to the following equation:- (1 ml silver nitrate 0.02 N = 1.08 mg hydrocyanic).

Amino Acids:

The amount of total amino acids were Estimated according to the method [15], and by digestion of (25) milligrams of powder cotyledons of apricot seeds in a capacity tube (25) ml and added to (10) ml of hydrochloric acid concentration (6) N and has a contains (0.01)% of (Mercaptoethanol), and after the good closure of the tube was heating in the oven on the degree of (110) ºC for (24) hours and then cooling to room temperature, filtration and washing the sediment by distilled water and completing volume to (25) ml in standard flask. Taking (5) ml of the filtrate in the beaker capacity (50) ml and placed in the dryer glass under vacuum in a beaker containing potassium hydroxide (KOH) in a solid status and another containing concentrates sulfuric acid until completely dry the sample and then remaining are solve in (1) ml of buffer solution (sodium esters) pH of (2.2) and kept at a temperature of (4) ºC to be analyzed by (Amino Acid Analyzer Beckman 119 CL).

Crude Oil:

The oil of the apricot seeds were extracted by soaking crushed cotyledons seeds in ether at temperature between (40-60) ºC for (24) hours with shaking at intervals, and filtration to separate resulting, a powder remaining were soaked in new pure solvent for (12) hour, then extracts resulting were collected in the flask and filtering, existence of a sufficient amount of anhydrous sodium sulfate are used to remove any of water, and then recover the solvent by rotor evaporator at temperature (12) ºC under vacuum to obtain crude oil [16].

- Physical and Chemical Properties of Oil:

Measure the refractive index and specific gravity at a temperature of (25) ºC, and estimated the values of iodine number, soaping, non- soaping material and the percentage of free fatty acids estimated as oleic acid and value of peroxide number (O_2 / kg) oil according to the method [14].

- Composition of Fatty Acids:

Estimated the fatty acids in the oil of the cotyledons of apricot seeds by using Gas Chromatography (GC/MS) (Perkin Elmer XL) (according to the method of [4], where we took (0.1) gm of the oil in a tube locked a good cover a capacity (50) ml and dissolved in (2) ml of benzene and then added (10) ml of methanol containing (1)% of a pure concentrated sulfuric acid, then lock the tube well and heating in the oven at a temperature of (90) ºC for a period of (90) minutes and after cooling to room temperature was added (10) ml of distilled water and then mixing good of the contents of the tube, and make extraction for the fatty acids of esters formed by using (1) ml of ether at temperature between (40-60)ºC with good mixing and repeated the extraction three times. The extracts were collected and passed through anhydrous sodium sulfate and concentrated by using nitrogen gas and kept in the refrigerator until analysis. We use Gas Chromatography (GC/MS) (Perkin Elmer XL) in the separation of methyl esters of fatty acids previously prepared and followed the following conditions: Use (DB-SF used silica capillary column) length (60) cm and the internal diameter (0.32) mm and the program temperature starts from (150) ºC and ends at (240) ºC and the gradual rate increase (3) ºC / min and the unit injection temperature of (230) ºC while the temperature of the scouts (250) ºC, fatty acids separated were identified by the detention time (R_t) in the presence of a standard sample of known fatty acids and calculate the proportion of each acid in the mixture by measuring the area under the curve .

- Separate Sections of the Oil:

Were separated sections of the oil of the cotyledons of apricot seeds, according to the method [17], which was activated thin layer sheets (Silica gel G Type 60, 0.25mm) in the oven at a temperature of (110) ºC for an hour and then determine the starting line and end line and placement of samples on activated thin layer plates and placed the samples in (Spots), quoted panels to a glass jar containing the mixture of solvents used in the separation which ether and diacetyl ether and snow acetic acid ratios

(70: 30: 2 v / v / v), and left panels the effect until the arrival of the solvent to the finish line and then rose from the vase Chapter and left to dry residue of the solvent at room temperature. Iodine vapors were used manifesting separated components, and calculate the values of pigments (R_f) in oil samples of apricot seed.

- **Statistical Analysis:**

Results were analyzed using the test (T-test) calculates the (Least Difference Significant) at the level of significance equal to or less than (0.05), depending on the method of [18].

RESULTS AND DISCUSSION:

Crude Cotyledons Seeds:

Table (1) shows the some important of physical properties of the apricots seeds on the basis of dry weight and the basic components to cotyledons seeds resulting a byproduct of the fruits of a species commonly planted in Iraq, represent the seeds of about (15) percent of the weight of overall fruit, and notes from the results that weight calculated for each (100) seed is (119.48) gm, and therefore, the average weight of seed per up to (1.19) gm almost, while the average size of the seed to (1.06) cm^3, and when calculating the specific weight of the seeds of the average weight and size found to be within the limits of ((1.126) gm / cm^3. The results showed that the proportion of cobalt percentage up to (62.19)%, while the cotyledons percentage was around (37.81)% of the weight of the seeds. It should be noted that the properties of cotyledons seeds are different depending on the type and thickness of the solid wood layer, has been found all of [6, 8, 10] that the proportion of cobalt in the apricot seeds, ranging from (62-69) %, while ranged of cotyledons between (31-38) %, and these results are consistent with the results of this study in the ratio of the cobalt and cotyledons of the apricots seeds.

The values in Table (1) shows that cotyledons seeds contain a high percentage of crude fat up to (50.93)% and the proportion is also high in protein up to (30.03)% and the percentage of the two main components (oil and protein) in cotyledons seeds up to (80.96)%, therefore its considered an important source rich in oil and protein, and the results shows also contain the cotyledons seeds on the proportion of ash up to (0.342)% on the weight of dry basis, while the crude fiber about (4)% and up the proportion of carbohydrates calculated the difference (extract without nitrogen) to (0.712)%, therefore, the results of this study agreed with [6].

It should be noted that the crude of the cotyledons of apricot seeds contains Amygdaline which decompose and give the toxic hydrocyanic acid and the results showed that the hydrocyanic acid percentage in the cotyledons remove oil (the exact raw) about to (0.27)% and this percentage consistent with [8, 11].

Oil of Cotyledons Apricot Seeds:

- Physical and Chemical Properties of Oil:

The physical and chemical properties of crude oil extracted from the cotyledons of apricot seeds before and after detoxification as shown in table (2), and it's show also in general no significant differences in physical properties (specific gravity, refractive index) between the crude extract before and after detoxification, as notes the rise in the ratio of free fatty acids (acidity) of up to twice in the crude oil extracted after detoxification compared extract before detoxification, and the acidity of crude oil was increasing because effect of the soaking process to the cotyledons seeds during detoxification process, before oil extraction, which led to the revitalization of the lipase enzyme (Lipase) and thus the high percentage of free fatty acids estimated as Oleg acid of (0.18)% in the Crude oil extract before detoxification to (1.69) % after detoxification. It is clear from the values of peroxide number of crude oil there is no significant difference between the crude extract before and after detoxification where (0.99 and 1.02) mile equivalent (O_2 / kg) oil, respectively, and the values of iodine number in crude oil (103.8 and 104.5) before and after detoxification respectively were no significant difference between them, and classify the oil cotyledons of apricot seeds depending on the value of iodine number in the dry half oils [16].

Table (1): Some Physical Properties of Crude Apricot Seeds are Calculated on the basis of Dry Weight and the basic Components of the Cotyledons Apricot Seeds (Crude Powder).

The Property	Value*
Weight 100 seeds (gm)	119.48
Size 100 seed (cm^3)	106.10
Specific weight (gm / cm^3)	1.126
Shell weight 100 seeds (gm)	74.31
weight 100 seeds (gm) Split	45.17
Cobalt ratio (%)	62.19
Cotyledons ratio (%)	37.81
Component	**Based on Dry Weight %**
Crude protein (N×6.25)	30.03±0.23
Crude Fat	50.93± 0.24
Total ash	2.34 ±0.15
Crude fiber	4.00±0.29
Carbohydrates calculated by the difference	12.70±0.23
Hydrocyanic acid **	0.27 ± 0.02

* Value represents the mean of three readings ± standard deviation (SD).

**Hydrocyanic acid estimation in the extract powder (cotyledons seeds removed oil).

Table (2): Some Physical and Chemical Properties of Oil, Crude Cotyledons Apricot Seeds (Before and After Detoxification).

The Property	Value of Crude Oil*	
	Extract Before Detoxification	Extract After Detoxification
Specific weight (25) °C	0.9114 [b] ±0.0002	0.9116 [b] ±0.0001
Refractive index (25) °C	0.0005 1.4680 [b] ±	1.4680 [b] ±0.0002
Free fatty acids (%) Estimated Oleg Acid	0.81 [b] ±0.02	1.69 [a] ±0.122
Peroxide number (mille equivalent O_2 / kg oil)	0.99 [b] ±0.0153	1.02 [b] ±0.059
Iodine number	103.8 [b] ±0.360	104.5 [b] ±0.502
soaping number	188.7 [a] ±0.251	187.9 [a] ±0.342
Non- soaping components (%)	1.23 [a] ±0.049	1.22 [a] ±0.070

* Value represents the mean of three readings ± standard deviation (SD).
Values in the rows that take the same letters mean no significant difference at the level of significance equal to or lower than (0.05).

It is also noted were no significant differences between the crude extract before and after detoxification for the values of soaping number, the percentage of non- soaping material and the iodine number, which is equal in the crude oil before and after detoxification, have agreed the results of this study with [16] for some properties such as specific gravity, refractive index and the value of soaping number.

- Fatty Acids:

Table (3) shows the percentage content of the oil cotyledons of apricot seeds to raw fatty acids before and after detoxification and shows in the oil cotyledons of apricots seeds that percentage of the oleic acid where the highest percentage between (69.00-69.41) %, followed by Linoleic acid (24.19 -24.48) % and Palmatic acid (4.32 - 4.80) %, while the other fatty acids are found in low percentage of crude oil. The oil of cotyledons apricot seeds contains a small percentage of saturated fatty acids (5.63 -6.09) % on the other hand increase the percentage of unsaturated fatty acids (93.91 -94.38) %, especially mono acids and that the ratio of unsaturated to saturated fatty acids up on average about (16). The result shows that the composition of fatty acids in the crude oil cotyledons of apricot seeds were no differences between the extracted crude oil before and after detoxification, and notes from the results obtained during this study of cotyledons of apricot seeds consistent with many other studies [19, 20].

Table (3): Percentages of Fatty Acids in Oil of Crude Cotyledons Apricot Seeds (Before and After Detoxification).

Fatty Acid (%)	Value of Crude Oil*	
	Before Detoxification	**After Detoxification**
Palmitic (0:16 C)	4.80	4.32
Lauric (1:16 C)	0.60	0.61
stearic (0:18 C)	1.20	1.22
Oleic (1:18 C)	69.0	69.41
Linoleic (2:18 C)	24.19	24.22
Linolenic (3:18 C)	0.12	0.14
Arahidonic (0:20 C)	0.09	0.09
Total Saturated Acids	6.09	5.65
Total Unsaturated Acids	93.91	94.38
The Ratio of Unsaturated : Saturated	15.42	16.76

* Value represents the mean of three readings ± standard deviation (SD).

- Oil Contains:

Were separated contains of the oil cotyledons of apricot seeds by using thin layer chromatography (TLC) and figure (1) shows separated components from the crude extract oil cotyledons of apricot seeds before and after detoxification, and shows the presence of eight components are separated by the polar lipids (phospholipids), mono ethyl glycerol, 1,2 , 3,2 – die-ethyl glycerol, estirol, 3,1 tri-ethyl glycerol, free fatty acids, tri-ethyl glycerol, hydrocarbons and finally esters glycerol arranged from the start to the final line, therefore that tri-ethyl glycerol is the main component and the highest percentage compared to the other components. The results also shows no differences between the extracted crude oil before and after the removal of toxic components which correspond to the two samples. That the results reached by [16] indicate the presence of four main contains glycerol (Triple, Binary, Mono), free fatty acids, substances of non- soaping and polar fats which is the results consistent with [11] to that tri-glycerol is the main component in the oil cotyledons of apricot seeds as well as the presence of free fatty acids and estirol and a low percentage of hydrocarbons and polar lipids.

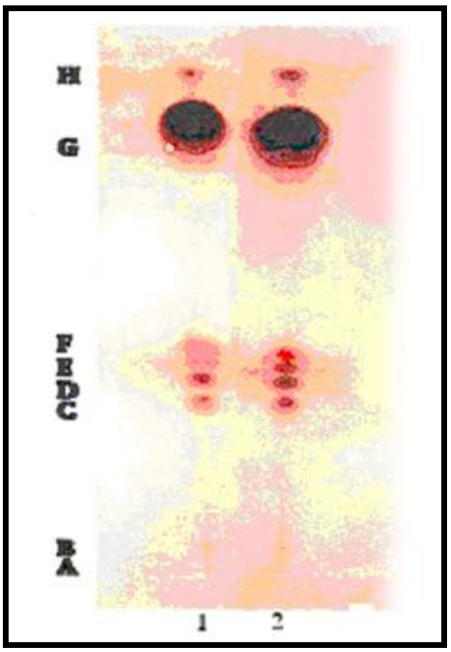

Figure (1): Separated Components from the Crude Oil of Cotyledons Apricot Seeds Extract Before and After Detoxification by Thin Layer Chromatography (TLC)

- The separated components.
A - Polar Lipids (Phosphate).
B - Ethyl glycerol.
C- 1,2, 3,2 die-ethyl glycerol.
D - Estirol.
E - 3, 1 ethyl glycerol.
F- Free fatty acids.
G - Tri-ethyl glycerol..
H - Hydrocarbons and esters estirol.

- **Samples**.
1. Crude oil apricot seeds after detoxification.
2. Crude oil apricot seeds before detoxification.

- **Carrier material**.
Silica gel, G (Type 60), thickness of 0.25 mm.

- **Separation solvent**.
Ether: die-acetyl ether: ice acetic acid
(v / v / v 2: 30: 70).

- **Iodine vapor**.

Studied the chemical composition of the cotyledons of apricot seeds after detoxification by soaking the full seeds in water (before oil extraction) or by soaking of the Crushing of the cotyledons seeds in water after extraction of oil, and table (4) shows the percentage of the components on a dry weight basis and notes that the powder of cotyledons seeds removed a toxicity become concentrates protein, where the percentage of protein (54.62 and 52.91) % when detoxification before and after the extraction of oil from cotyledons seeds, respectively. There are significant differences in the content of powder from the protein between the two methods to remove toxic because of this difference to soak crushed cotyledons seeds removed fat in water to remove toxic leading to it was part of the proteins dissolved in water, while in the other way to remove toxic is soak full cotyledons seeds in water before oil extraction, which reduces the loss of the protein. Powder of cotyledons seeds are contains on a small

percentage of crude oil up to (2.16 and 3.46) % for the two methods, respectively, as shown in Table (4) also the percentage of total ash and crude fiber in the powder cotyledons seeds removed toxicity. The percentage of ash be less when detoxification is occurs After oil extraction, as is the case in the percentage of protein because of loss of soaking water through the detoxification process, while noting the crude fibers are increase in the content of powder of cotyledons seeds because of decrease for each of the protein and ash in the first method of detoxification. It is clear from the results there is no significant difference in the total carbohydrates contents of the product powder were calculated the difference of up to (34.96 and 35.50) %, respectively, for tow methods of detoxification. According to [6, 21] results for chemical composition for the powder of the cotyledons apricot seeds removed toxicity consistent with the results of this study, and notes that the remainder concentration of the hydrocyanic acid, and the output from the hydrolysis of Amygdaline after detoxification soak this full cotyledons seeds (before oil extraction) up to (6.2) mg / 100 gm, while the remainder of it in a way (soaking crushed cotyledons seeds after extracting oil) up to (9.1) mg / 100 gm. As can be seen from the results that the remainder of the hydrocyanic acid represents about (2.3)% and thus the percentage of removal to (97.7%) in a way (detoxification soak this full cotyledons seeds before oil extraction), while the remainder of the hydrocyanic acid the method the other (soak crushed cotyledons seeds after oil extraction) up to (3.37)% and therefore the efficiency of detoxification (removal of hydrocyanic acid) up to about (96.63)% and because the difference between the two methods mainly to the time of soaking and the degree of activity of the Emulsin enzyme responsible for the hydrolysis of Amygdaline in the cotyledons of apricot seeds, and the results obtained notes that the concentration of hydrocyanic acid was lower by a simple with what the [8, 11], where the ratio of hydrocyanic acid within the limits of (0.32)% compared to what we found in this study, which amounted to (0.27)% for the of apricots seeds in the local markets of Iraq.

Table (4): Percentage of the Basic Components to Powder of Cotyledons Apricot Seeds Removed Toxicity (Before and After Oil Extraction) (Dry Weight Basis).

Component **(%)**	**Value for the powder cotyledons seeds removed toxicity ***	
	Detoxification of full cotyledons seeds before the oil extraction	**Detoxification of powder cotyledons seeds after oil extraction**
**Crude Protein	54.62 [a] ± 0.22	52.91 [b] ±0.35
Crude Fat	2.16 [b] ±0.15	3.46 [a] ±0.19
Total Ash	2.83 [a] ±0.11	2.46 [b] ±0.21
Crude Fibers	5.43 [b] ±0.10	5.67 [a] ±0.23
Carbohydrates calculated by the difference	34.96 [a] ±0.24	35.5 [a] ±0.36
Hydrocyanic acid (mg/100 gm)	6.2 [b] ±0.1	9.1 [b] ±0.1

* Value represents the mean of three readings ± standard deviation (SD).
Values in the rows that take the same letters mean no significant difference at the level of significance equal to or lower than (0.05).
** N × 6.25

- Mineral Elements

Table (5) shows a powder contains of cotyledons of apricot seeds for mineral elements before and after the removal of toxic and that powder contains higher concentrations of mineral elements before detoxification compared with after detoxification. The elements were found in high concentration in the powder of cotyledons apricot seeds before detoxification is phosphorus, potassium, magnesium, calcium and sodium, where up its to (642, 633.8, 140.6, 72.6 and 69.4) mg / 100 gm, respectively, and other elements found in concentrations are relatively small which is zinc, iron, copper and manganese. The effect of the detoxification process in powder seeds contains from the mineral elements is relatively little, especially when detoxification before oil extraction (detoxification full cotyledons seeds), while the detoxification of crushed cotyledons seeds after oil extraction was more effect on the concentration of mineral elements, the concentration of mineral elements are decrease after detoxification because the loss these elements in the soaking water through the detoxification and especially after the oil extraction to increased surface area of the crushed cotyledons seeds compared with the full cotyledons seeds in the other method detoxification. The concentration of phosphorus, magnesium, zinc and copper in the powder cotyledons of apricot seeds removed Amygdaline was agree with [11] and disagree in the other elements in varying degrees.

Table (5): A contents of Cotyledons of Apricot Seeds in Mineral Elements Before and After Detoxification, and the Exact Powder Content Remove the Toxicity (Before and After oil Extraction).

Element	mg/100 gm		
	Powder of cotyledons apricot seeds before detoxification (crude powder)	**Powder of cotyledons seeds removed toxic**	
		Detoxification of full cotyledons seeds before the oil extraction	**Detoxification of powder cotyledons seeds after oil extraction**
Potassium (K)	633.84	512.6	321.2
Magnesium (Mg)	140.64	138.4	134.5
Calcium (Ca)	72.57	67.5	56.3
Sodium (Na)	69.39	62.1	52.6
Manganese (Mn)	1.10	1.02	0.94
Zinc (Zn)	8.45	7.83	7.10
Iron (Fe)	6.46	5.36	4.92
Copper (Cu)	1.47	1.31	1.28
Phosphorus (P)	642	642	529

- Amino Acids

The types and amounts of amino acids in the powder of cotyledons apricot seeds before and after detoxification in two different methods by soaking in water for a full cotyledons seeds before oil extraction as well as soaking in water to cotyledons the crushed seeds after oil extraction and Can be shown in table (6). It is clear from the results that the Glotamic acid is the main acid (high concentration), where up to (24.4 gm / 100 gm protein) followed by aspartic acid (10.18 gm / 100 gm protein) and two of the non- essential amino acid, and also noted that the powder of cotyledons of apricot seeds before detoxification containing moderate amounts of most non- essential amino acids except the amino sulfate acid and Threonine, and when comparing the effects of detoxification both methods on the content of powder of cotyledons apricot seeds of amino acids observed a decrease in some amino acids and an increase in others, that of essential and non- essential amino acids both. Table (6) is clear also that the total non- essential amino acids a close significantly in the powder removed toxic both ways compared (crude powder) before detoxification, as well as for amino acids of non- essential amino acids, the results of this study are agreed with [1, 8, 11].

Table (6): Types and Amount of Amino on a Powder of Cotyledons of Apricot Seeds Before and After Detoxification, and the Content of Exact Powder Removed of Toxicity (Bbefore and After Oil Extraction), which was obtained Compared to what Reported by the Food and Agriculture (FAO).

Amino acid	gm/100 gm protein			
	Powder of cotyledons apricot seeds before detoxification (crude powder)	Powder of cotyledons seeds removed toxic		Food and Agriculture Organization (FAO)
		Detoxification of full cotyledons seeds before the oil extraction	Detoxification of powder cotyledons seeds after oil extraction	
essential amino acid				
Valine	3.52	4.60	4.48	3.5
Leucine	5.84	6.15	5.93	6.6
Isoleucine	6.96	7.06	7.09	2.8
Threonine	2.70	2.91	2.79	3.4
Lysine	5.02	3.50	3.13	5.8
Vinaline	5.02	5.32	5.49	6.3
Tryptophan	ND	ND	ND	1.1
Methionine	0.60	0.68	0.70	2.5
Cystine	0.10	0.20	0.13	--
Non- essential amino acid				
Aspartic	10.18	12.87	11.08	--
Glotamic	24.42	23.42	24.32	--
Glaisine	4.79	4.82	4.66	--
Aalnine	5.17	4.82	5.12	--
Histidine	4.38	3.20	2.32	--
Arginine	7.44	6.78	7.18	--
Serine	4.33	3.07	4.29	--
Proline	4.59	3.56	4.59	--
Thyrosine	4.84	3.00	3.04	--
Total of essential acids	29.76	30.42	29.74	--
Total of non-essential acids	67.14	65.54	66.6	--

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