

Study of some physicochemical properties and bioactivity of gum extracted from *Linum usitatissimum*

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ABSTRACT

Gum was extracted from linseed (*Linum usitatissimum*) in north of Iraq, which is an annual growth plant. Organoleptic characterization of: color, odor, taste, fracture and texture. Physico-chemical properties were determined: pH, bulk density, tapped density, bulkiness, swelling index, ash values, carr's index, Hausner's ratio and angle of repose. Thin Layer Chromatography paper was used to monitor the extracted saccharides by comparing the spots with the of the standards and flow rate Rf calculated. The FT-IR spectrum of the product showed an absorption bands at 3666.29 cm^{-1} (-OH), 2966.76 cm^{-1} (C-H), 2640.44 cm^{-1} (C=C), 1826.62 (C=O), 1420.04 (C-H bend). Anti-microbial activity evaluated of the gum and observed that gum does not any significant antibacterial activity such as cell wall destruction.

binder oral tablets and microcapsules, gelling agent, coating agent, thickening agent, creams, pills, lotions and suspensions agent.^(4, 5) The aim of in review research work is to separate the gum from (*Linum usitatissimum*) and study of some Physicochemical and bioactivity of gum.

Materials and methods:

The seeds of linseed were purchased of herbage shop in north of Iraq (Erbil) then washed twice with distilled water to remove debris and dirt without crushing and dried at room temperature.

Extraction of Mucilage:

Mucilage was extracted from plant material by two steps as following.

Step 1: water extraction of Mucilage:

Introduction:

Natural polymers are vast used in design of dosage forms comprised to oral tablets and microcapsules formulation have been used abundant for many years.⁽¹⁾ Herbal products were used for centenary years as alternative synthetic drugs. Their uses were significantly increased in the last years, due to low cost, friendly-environmental, vastly available, non-toxicity and non-irritating effects, compared with the synthetic drugs which are of side effects, environmental pollution, toxicity and high cost. The major components of gums are polysaccharides which are of great importance to the pharmaceutical industrial as a potential selection for New Drug Delivery System (NDDS).⁽²⁾ Many kinds of gums are known and vastly available of these are: Arabic gum, Xanthan gum, Mucuna gum, Aloe gum, Okra gum, Fenugreek gum and Linseed (Flaxseed) gum which are used as pharmaceutical formulation materials because of their a good flow properties and formulation.⁽³⁾ Gums have others applications e.g. food and pharmaceutical industry applications they are used

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Also, powder gum was observed to tapped and bulk apparatus until obtained constant. ⁽¹¹⁾

Hausner's Ratio and compressibility:

Hausner's ratio and compressibility (Carr's index) were determined from tapped and bulk densities. ⁽¹²⁾

Powder Flow Property:

Powder flow property was measured by a constant height funnel also, known angle of repose. ⁽¹²⁾

Thin Layer Chromatography (TLC):

(TLC) paper used of qualitative identified. Moved phase was used n-butanol: acetic acid: distilled water (40:10:10cm³) and using some mono-saccharides: arabinose, mannose, glucose, rhamnose, xylose and fructose as a reference standard. ⁽¹³⁾

FT-IR spectrum of gum:

Weighed amount of milligrams of powder gum and mixed with potassium bromide disk (400mg) then compressed at 15 tons pressure and measured from 400- 4000 cm⁻¹ by using a broker FT-IR spectrophotometer. ⁽¹⁴⁾

Antimicrobial activity:

(*Linumu usitatissimum*) gum was analyzed for the anti-microbial growth against some pathogenic bacteria depending agar plate method. ⁽¹⁵⁾

Results and Discussion

Linum usitatissimum gum was separated by hot water extraction method and then subjected to identification. Confirmation test of gum was accomplished it gave positive result of molish's and benedict's tests which are major indicators of presence polysaccharides also, other biochemical test done such as lipids test, tannins test, alkaloids test and ninhydrine test table (1) showed the biochemical tests that done

Gum obtained from soaked (40 gm) of seeds in (400 cm³) from (5 M) of prepared solution (21gm NaHCO₃ + 500 ml distilled water) then, heated the mixture at 40°C for 2 hours with continues startier.

Step 2 : ethanol extraction of mucilage :

Gum had been extracted by using aqueous ethanol (80%) for precipitated, filtered by filtered off (Whiteman no.1) filter paper then, dried in hot air oven at 45°C and grained to obtain powder. ⁽⁶⁾

Phytochemical Tests:

Biochemical tests accomplished on extracted gum including: Molish's test, Benedict's test, Ninhydrine test, Alkaloids test, Proteins test, Lipids test, to determine the purity of the extracted gum.

Physicochemical properties evolution of separated gum:

Organoleptic characterization of separated gum including: color, odor, fracture and texture were determined. ⁽⁷⁾ Identification tests for carbohydrate, fat were performed according to standard procedure. ⁽⁸⁾

pH of gum:

1% w/v prepared of gum solution. Dissolved amount of powder in distilled water and the pH was measured by using pH- meter device. ⁽⁹⁾

Swelling Index of separated gum:

Weighed 1gm of powder gum placed into a 10ml glass stopper measured cylinder thence, added 10ml of distilled water and mixed every 5min for 2hr and allowed to ground for 24hr. The volumes observed and the method repeated twice. ⁽¹⁰⁾

Tapped and Bulk densities:

Weighed amount of powder gum was placed into graduated cylinder and the volume measured.

Table (4): Physicochemical properties study of isolated gum

Parameter	Results
Bulk density(gm/cc)	0.612
Tapped density(gm/cc)	0.927
Yield (%)	10%
Bulkiness	2.64
Carr's index	33.83
Ash Value (%)	6.31
Water-soluble Ash (%)	5.88
Acid-soluble Ash (%)	5.11
Hausner's ratio	1.52
pH	10.3
Angle of repose (°)	31.33
Swelling index (%)	82.22

Table (5): Microbial effect of (*Linum usitatissimum*) gum powder

Parameter (Pathogen Bacteria)	Result
a. <i>Staphy. Aureus</i>	No growth (absent)
b. <i>Pseudo. Aeruginosa</i>	No growth (absent)
c. <i>E. coli</i>	No growth (absent)

Conclusions

We concluded that (*Linum usitatissimum*) seed gum can be used as drugs formulation to preparation oral tablet and capsules also, concluded from separated gum that linseed gum has good flow property. The bioactivity study that included anti-microbial activity, observed does not found activity against growth bacteria as a result that considers a novel study. We conclude if that gum carrying medication activity will be a high viscosity make up covering the gastrointestinal media perform to stopping mechanism of bacteria and then perform to death.

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on extracted gum. These results considered as a proof for purity of isolated gum. FT-IR spectrum was measured and the active groups showed in table (2). The organoleptic properties of the isolated gum was depicted in table (3) in which color of isolated gum was found to be milky-white with characteristic taste. Physicochemical properties were determined and the results were shown in table (4). Also, bioactivity studying that included antimicrobial activity of gum observed that gum does not any significant against bacteria growth the results shown in table (5).

Table (1) biochemical tests done on extracted gum

Biochemical Tests	Linseed gum
Molish's Test	Positive (+ve)
Benedict's Test	Positive (+ve)
Alkaloids Test	Positive (+ve)
Ninhydrine Test	Positive (+ve)
Proteins Test	Positive (+ve)
Lipids Test	Positive (+ve)
Tannins Test	Positive (+ve)

Table (2) Active groups in FTIR spectrum of (*Linum usitatissimum*) gum

No.	Group	Wavenumber(cm ⁻¹)
1	O-H Stretch	3666.29
2	C-H	2966.76
3	C-H	2810.52
4	C=C	2640.44
5	C=O	1826.62
6	C-H bend	1420.04

Table (3): Organoleptic properties of isolated (*Linum usitatissimum*) gum

Parameter	<i>Linum usitatissimum</i> gum
Color	Milky-White
Odor	Odorless
Taste	Characteristic
Fracture	Rough
Texture	Rough & Irregular

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دراسة لبعض الخصائص الفيزيائية-الكيميائية والفعالية الحيوية

للصمغ المستخلص من (*Linum usitatissimum*)

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الخلاصة:

استخلص الصمغ من بذور الكتان في شمال العراق, الذي ينمو النبات سنويا. قيمت المميزات الحسية : لون, رائحة, ذوق, الكسر والتكوين. قدرت الخصائص الكيميائية-الفيزيائية المختلفة : الدالة الحامضية, كثافة الحجم, كثافة النقر, التضخم, عامل الانتفاخ, قيم الرماد, عامل كار, نسبة هاوسنير وزاوية السكون. استخدمت كروموتوغرافيا الطبقة الرقيقة لمراقبة السكريات المستخلصة بواسطة مقارنة البقع مع تلك القياسية وحسب معدل الجريان. بينت قمم امتصاص لطيف الأشعة تحت الحمراء عند:

3666.29 cm^{-1} (-OH), 2966.76 cm^{-1} (C-H), 2640.44 cm^{-1} (C=C), 1826.62 (C=O), 1420.04 (C-H bend)

قيمت الفعالية ضد الاحياء المجهرية للصمغ ولوحظت ذلك الصمغ لا يعمل أي أهمية فعالية ضد البكتريا مثال لذلك تحطم جدار الخلية.