Original Article

Random Estimate the values of seed oil of *Cucurbita maxima* by refractive index method

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**Abstract**

The crude oil having lower iodine and free fatty acids values has *Aamdosha* properties. These properties are present due to toxic and anti-toxic compounds. These compounds can be harmful for the special diseases and may be unsaturated, saturated, open chain etc. The adulteration can take part as catalytic action for the toxic effect for the special diseases. Toxic properties of oils are removed by different ingredients and methods. *C. maxima* seed tail (mst) is used with food and medicine. The present paper deals with the study of oil by refractive index and equations.

**Key words:** Seed oil of *Cucurbita maxima*, bio-sciences, refractometer, equations.

**Introduction**

Quality control and standardization of crude and medicated oil is dire need of today for putting the oil pharmacy on sound footing. The raw materials brought into market in various forms are frequently adulterated with cheaper, less potent or spurious materials posing danger to public health. Novelty of the dietary and medical oils have been attracting the chemists for the last three or four decades. Pharmacological application encouraged the chemists to go ahead with their work to the relation of diseases. The preliminary values can not solve the problems of bio-sciences. Bio-sciences problems are very wide and deep. Refractive index method has been created as one of the most appreciated techniques to study the different values. The advantages of the method are its simplicity, selectivity and rapidity of determination the values. The study of *Cucurbita maxima* seed oil has also been done\(^1\), but accurate identity is still unclear from the bio-sciences points of view. Few equations have been used for the determination of different constant values, because the pH of human body is made up of between 4 to 8. These equations are also give with a view to provide scientific and systematic informations, which will be highly useful to maintain uniformity and quality of the oil. The purpose of the presentation is to report (1) a new direct random estimation of different values from refractive index value and (2) comparative study of random estimated values with those obtained by using the experimental values for the same of *C. maxima* seed tail (mst).

**Materials & Methods**

Refractive index (n) values of (mst) have been determined by Abbe’s refractometer and calculated from equations (02) and (03)\(^2-3\):

\[
 n=1.4576+0.000116 (I) \quad (02)
\]

\[
 n=1.4643+0.000066 (S) -0.0096 (A) +0.0001171 (I) \quad (03)
\]

The random estimation of constant values from the (n) have been determined by different equations\(^4-6\).

**Results & Discussion**

Acid, free fatty acids, degree of acidity, molecular weight, apparent density, refractive index, unsaturation values are essential for the potency and life of tail, because free fatty acids have greater medicinal value.

Table 1, different values (glycerol, glyceride, pure fatty acids, number of oxygen required for combustion, Lund’s, relation between neutralization number and equivalent, agni, internal energy), which are determined by equations from (n) of instrument and calculated, are found approximate constant. Slightly variable is found due to temperature effect. So, these equations are very useful for the random estimation of different values. Eq.(02) is not reliable for the estimation of different values of oils, because it is used for purely unsaturated oils\(^5\).

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Table 1: Random estimation of different values from refractive index (N) of Seed Oil of *Cucurbita Maxima*

| Sr. No. | Parameter | Abbé's refractometer at 40°C | Eq. (02) | Eq. (03) | Practical | Calculated |
|---------|-----------|-------------------------------|----------|----------|-----------|------------|
| 1       | Refractive index ( ) | 1.4656 | 1.4699 | 1.4888 | - | - |
| 2       | Sp. refraction (r) | 0.2767 | 0.3141 | 0.3185 | - | - |
| 3       | Molar refraction (Mr) | 126.71 | 131.39 | 155.76 | - | - |
| 4       | Empirical Eykman constant (EEV) | 0.6959 | 0.6988 | 0.7110 | - | - |
| 5       | Polarizability (α) X $10^{25}$ | 6.9522 | 7.2282 | 8.7015 | - | - |
| 6       | Lund's value (nD ) | 1.4655 | 1.4697 | 1.4882 | - | 1.4652 |
| 7       | Molar radii (r) A° | 18.331 | 19.433 | 25.668 | - | - |
| 8       | Apparent Density (Apd) | 0.8843 | 0.8883 | 0.9059 | - | 0.9033 |
| 9       | Sp. gravity (Sp. gr) | 0.8995 | 0.9033 | 0.9203 | 0.9130 | 1.0507 |
| 10      | (Sp. gr.) - (Apd) = ( ) | 0.0152 | 0.0150 | 0.0144 | - | - |
| 11      | Molecular weight (M) | 404.95 | 418.30 | 488.98 | - | - |
| 12      | Agni (Cal / gm.) | 804.15 | 808.35 | 9025.5 | - | 9579.8 |
| 13      | Molecular volume (M / Apd) | 457.93 | 470.89 | 539.77 | - | 321.32 |
| 14      | Internal energy (e) | 7419.5 | 7436.5 | 7423.5 | - | 9276.9 |
| 15      | Hubl | 0.6129 | 0.6442 | 0.8329 | - | 358.53 |
| 16      | Double bond (Db) | 1.1508 | 1.8065 | 5.2385 | - | 9579.8 |
| 17      | Formula weight of Ester | 404.95 | 418.30 | 488.98 | - | - |
| (a) Pure monoglyceride (M$_{m}$) | 409.76 | 425.27 | 494.74 | - | 302.88 |
| (b) Pure diglyceride (M$_{d}$) | 819.52 | 846.54 | 989.46 | - | 605.75 |
| (c) Pure triglyceride (M$_{t}$) | 1229.3 | 1269.8 | 1484.2 | - | 908.63 |
| (d) Mean formula weight of combined fatty acids in neutral pure triglyceride (M$_{n}$) | 370.08 | 410.59 | 539.77 | - | 908.63 |
| 18      | Acid Value (A) | 84.895 | 80.626 | 61.853 | 0.5300 | - |
| 19      | Free fatty acids (ffa) | % 42.699 | 40.553 | 31.112 | - | - |
| 20      | Saturated acids (SA) | % 21.409 | 17.605 | 0.8871 | 27.750 | 39.727 |
| 21      | Unsaturated acids (USA) | % 38.052 | 70.844 | 99.112 | - | 60.273 |
| 22      | Oleic acids (OA) | % 63.623 | 49.526 | ( – ) 12.477 | 14.140 | - |
| 23      | Linolenic acid (LA) | % 33.662 | 36.136 | 47.011 | - | 27.750 |
| 24      | Linolenic acid (LNA) | % 8.9549 | 11.143 | ( – ) 101.05 | - | - |
| 25      | Saponification value (SV) | 136.93 | 132.56 | 113.41 | - | - |
| 26      | Unsataponification equivalent (SE) | 409.75 | 423.26 | 494.74 | - | 302.88 |
| 27      | (SV) X (SE) | 056107 | 056107 | 056108 | - | 056108 |
| 28      | Degree of splitting (DS) | % 61.997 | 60.823 | 54.557 | - | 0.2861 |
| 29      | Ester value (E) | 52.031 | 51.938 | 51.531 | - | 184.72 |
| 30      | Iodine value (I) | 72.698 | 109.63 | 270.44 | - | - |
| 31      | Iodine value of (USA) (IVUSA) | 72.401 | 111.38 | 276.29 | - | - |
| 32      | Iodine value of neutral fat (IVNF) | 3.0000 | 3.0000 | 1.5000 | - | - |
| 33      | (IVUSA) - (IV tail) | ( – ) 0.2970 | 1.7590 | 4.3580 | - | - |
| 34      | (IV) tail) - (IVNF) | 69.698 | 106.63 | 270.44 | - | - |
| 35      | Glycerol | 29.465 | 29.397 | 29.191 | - | 101.04 |
| 36      | Glyceride value (x) | 055449 | 055449 | 055455 | - | - |
| 37      | Pure neutral oil | 1.4655 | 1.4698 | 1.4887 | - | - |
| 38      | Pure fatty acids | 1.5009 | 1.5051 | 1.5242 | - | - |
| 39      | Neutral fat | 071.55 | 107.65 | 268.19 | - | 105.11 |
| 40      | Number of oxygen required for combustion (no) | 192.99 | 193.04 | 193.29 | - | 183.87 |
| 41      | Bromide number of mixed acids | 18.037 | 14.861 | 0.9102 | - | - |
| (a) Poly (PNMA) | 17.211 | 14.145 | 0.6734 | - | - |
| (b) Octa (ONMA) | 08.232 | 10.528 | 9.2643 | - | - |
| (c) Hexa (HNMA) | 21.656 | 19.404 | 9.5024 | - | - |
| (d) Tetra (TNMA) | 293.08 | 294.59 | 295.07 | - | - |
| 42      | Thiocyanogen value of unsaturated acids (TCVUSA) | 64.973 | 84.054 | 167.92 | - | - |
Refractive index values of Abbe's refractometer and calculated by eqs. (02) and (03) have too much dissimilarity, this may be due to effect of temperature, heterogeneous properties, polarity and unsaturation. Different percentage of (SA) and (USA) in experiment, instrument and calculated confirms some other unsaturated acids or compounds are present in oil, which confirms the values of (OA) and (LNA) of eq. (02).

The controversy of (OA) and (LNA) present in exp. and eq. (02) while absence in eq. (03), indicates the trace amount may be present in (mst). Iodine value of eq. (03) is higher than exp. and eq. (02) values, may be due heat induced surface polymerization. This is also supported by less iodine values than more (n.o.) values. Lower Agni's values from (n) values indicate the presence of polymerize properties without conjugate double bonds, but the Abbe's and eq. (02) values do not prove this properties. Higher acid values from experimental value give positive Kreis test, rancidity may not be possible. Abbe's iodine value is found less than 100, so it belongs to non-drying group of oil.

Less value of monoglyceride from pure value (56108.0) may be the presence of impurity or unsaturation. The constant glycerol values indicate the glyceride, lactones and estolides are absent in oil, but the higher exp. and calculated values from pure value (56108.0) from Abbe's eqs. (02) and (03) indicates the presence in oil.

The relationship between neutralization number and properties is of course the same. The Abbe's value is much less than given constant value indicates the semipolar of (mst). Iodine value of eq. (03) while absence in eq. (02), indicates the presence of impurity or unsaturation.

Lower Agni values (Abbe's, eqs. (02) and (03)) from experimental value indicate the chain length of saturated and unsaturated fatty acids have been broken.

The values of (rD) and (FEV) are useful for the study of temperature and pressure effect, because they are independent on temperature and pressure. The exp., eqs. (02) and (03) values are found approximate constant value. The various (r) and (α) values show the effect of temperature in crude oil.

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हिंदी सारांश

कुकर्षीटा मैक्सिमा के बीज तेल का रिफ्रेक्टीव इन्डेक्स पद्धति से अध्ययन

आर. बी. सक्षेत्र

अकुक्त तेल जिसमें कम आयोडिन और स्वतंत्र वसा तेल की मात्रा होती है उसमें आमदोष के गुण पाये जाते हैं। यह गुण उसमें जहरीले तथा विपरीत-जहरीले यौगिकों के कारण होते हैं। यह यौगिक कई सामी बीमारी में ज्यादा नुकसान पहुँच सकते हैं। ये संतुच्च, असंतुच्च, खुली, श्रृंखला आदि में दूरस्थिि हो सकते हैं। मिलाकर इसका प्रयोग उद्देश्य का कार्य करती है, जिससे जहरीले पदार्थ उस सामी बीमारी पर तेजी से प्रभाव डालते हैं। तेल के जहरीले प्रभाव को अलग-अलग उपादान और तरीकों से हटा सकते हैं। कुकर्षीटा मैक्सिमा के बीज तेल का रिफ्रेक्टीव इन्डेक्स पद्धति से अध्ययन तेल का उपयोग भोजन तथा औषधियों में उपयोग किया जाता है, मगर जितना होना चाहिए उतना नहीं होता है। इस लेख में इस तेल की मुख्य कीमतों का निर्देश गिरानेवाली अनुक्रमणिका (रिफ्रेक्टीव इन्डेक्स) तथा समीकरणों द्वारा अध्ययन किया गया है।