Original Article

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

R. B. Saxena*

Central Research Institute - Ayurveda, Aamkho, Gwalior.

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 ingrediants 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 dier need of to-day 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 poising danger to public health. Novelty of the dietary and medical oils have been attracting the chemists for the last three or four decades. Pharmocological 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).

*Ex. Research Officer - Chemistry, 2, Ganesh Colony, Naya Bazar, Gwalior-9.

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Materials & Methods

Refractive index (n) values of (mst) have been determined by Abbe's refractometer and calculated from equations (02) and (03)[2-3].

$$n=1.4576+0.000116\ (I) \qquad (02)$$

$$n=1.4643+0.000066\ (S)\ -0.0096\ \frac{(A)}{(S)}\ +0.0001171(I) \qquad (03)$$

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].

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

Sr. No.	Parameter	Refractive index (n)			Experimental value	
		Abbe's refractometer at 40°C	Eq. (02)	Eq. (03)	Practical	Calculated
1	2	3	4	5	6	7
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.	Emprical 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. gr.) - (Apd) = ( )	0.0152	0.0150	0.0144	-	0.1574
10.	Sp. gravity (Sp. gr)	0.8995	0.9033	0.9203	0.9130	1.0507
11.	Molecular weight (M)	404.95	418.30	488.98	-	290.25
12.	Agni (Cal / gm.)	8041.5	8038.5	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	-	1.2819
17.	Formula weight of Ester					
	(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_F)	370.08	410.59	482.07	-	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)	% 78.591	82.395	99.112	73.030	60.273
22.	Oleic acids (OA)	% 63.623	49.526	(–) 12.477	14.140	-
23.	Linolenic acid (LA)	% 33.662	36.136	47.011	52.690	-
24.	Linolenic acid (LNA)	% 8.9549	11.143	(–) 101.05	-	-
25.	Saponification value (SV)	136.93	132.56	113.41	185.25	-
26.	Unsaponification 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	271.94	105.12	-
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	-	055769
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					
	(a) Poly (PNMA)	18.037	14.861	0.9102	-	-
	(b) Octa (ONMA)	17.211	14.145	0.6734	-	-
	(c) Hexa (HNMA)	08.232	(–) 10.528	(–) 92.983	-	-
	(d) Tetra (TNMA)	21.656	19.404	9.5024	-	-
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, heterogenous properties, polarity and unsaturation[7].

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[9,10]. This is also supported by less iodine values than more (n.o.) values. Lower Lund's values from (n) values indicate the presence of polymerize properties without conjugate double bonds[6], but the Abbe's and eq. (02) values do not prove this properties[11]. Higher acid values from experimental value give positive Kreis test, rancidity may not be possible[12]. Abbe's iodine value is found less than 100, so it belongs to non-drying group of oil[13].

Less value of monoglyceride from pure value (56108.0) may be the presence of impurity or unsaturation[14]. The constant glycerol values indicate the glyceride, lactones and estolides are absent in oil, but the higher exp. (101.04) from Abbe's eqs. (02) and (03) indicated the presence in oil[4].

The relationship between neutralization number and equivalent is of course the same. The Abbe's value is much less than given constant value indicates the semipolar of (mst)[15], but eqs. (02) and (03) values are found approximate constant prove the non-polarity[14].

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[16,17].

The values of (rD) and (FEV) are useful for the study of temperature and pressure effect, because they are independent on temperature and pressure[18]. The exp., eqs. (02) and (03) values are found approximate constant indicate more accouracy of groups and elements for the compounds of (mst)[19]. The various (r) and (α) values show the effect of temperature in crude oil[19].

References

1. M.A.Alfawaz, Chemical composition and oil characteristic of *Cucurbita maxima* seed karnels, Res. Bult. 129, Food Science and Agric. Res. Centre, king Sand Univ., 5-18 (2004).
2. R.B. Saxena, Random estimation of different values in Guducyadi tail from refractive index, J. Ayurveda Sameeksha, 1, 9, 240-242 (1998).
3. K. Mittal, G.A. Norris, J. Alexander and D. Swern, Bailey's Industrial Oil and products, Inter Sciences Publishers.Division of john Wiley and Sons, New York (1964).
4. L.V. Cocks and C.Van Redy, Laboratory Hand Book for Oil and Fat Analysts, Academic Press London (1966).
5. R.B. Saxena, Estimation of different values of tails by refractive index, J. Res. PL & Med., 14, 2, 13-19 (1993-1994).
6. R.B.Saxena, Study of Dashamula tail by index of refraction method, J. Aryavaidyan, 7, 3, 153-156 (1994).
7. R.B. Saxena, Standardization of Panchaguna tail, Asian J. Chemistry, 1, 2, 181 (1989).
8. R.B. Saxena, Random estimation of different values in Mushaka tail, Sachitra Ayurved, 47, 12, 940-944 (1995).
9. L. Zeleny and D.A. Colman, Oil and Soap, 253 (1936).
10. S. Glasston, Text Book of Physical Chemistry, Macmillan Indian Press, Madras (1981).
11. J. Lund, Z. Unter, Nahr, Genu., 44, 113 (1922).
12. G.L. Jenkins, J.E. Christian and G.P. Hager, Quantitative Pharmaceutical Chemistry, McGraw Hill Company Ind. New York, 276 (1973).
13. R.B. Saxena, H.C. Mehta and M.T. Daswani, Study of Bayyuccaya Surendra Tail, J. Sc. Res. PL & Med., 13, 1, 17-22 (1995).
14. R.B. Saxena, M.T. Daswani, and P.D. Trivedi, Study of Kubja Prasarini Tail, J. Aryavaidyan, 5, 4, 232-237 (1992).
15. K.F. Mittil, F.A. Norris, A.J. Stiroton and D. Swern, Bailey's Industrial Oil and Fat Products, Interscience Publishers, A division of John Willey and Sons, New York, 58, 111 (1964).
16. R.B.Saxena, Agni study of Dashamula tail, National Journal of Ayurveda, 4, 4, 10 (1994).
17. R.B. Saxena, Determination Agni of Ayurveda Tails, J. Sc. Res. PL & Med., 13-14, 51-56 (1992-1993).
18. J.A. Dean, Lange's Hand Book Company, New York, 10,93 (1972).
19. R.B. Saxena, Study of Any tail, Sachitra Ayurved, 46, 11, 845-849 (1994).

हिन्दी सारांश

कुकर्बीटा मैक्झिमा के बीज तैल का रिफ्रेक्टीव इन्डेक्स पद्धति से अध्ययन

आर. बी. सक्सेना

अपक्व तैल जिसमें कम आयोडिन और स्वतन्त्र वसा तैल 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 कोई खास बीमारी में ज्यादा नुकसान पहुँचा सकते हैं। ये संतृप्त, असंतृप्त, खुली, श्रृंखला आदि में उपस्थित हो सकते है। मिलावट इस क्रिया पर उत्प्रेरक का कार्य करती है, जिससे जहरीले पदार्थ उस खास बीमारी पर तेजी से प्रभाव डालते हैं। तैल के जहरीले प्रभाव को अलग-अलग उपादान और तरीकों से हटा सकते हैं। कुकर्बीटा मैक्झिमा के बीज तैल का रिफ्रेक्टीव इन्डेक्स पद्धति से अध्ययन तैल का उपयोग भोजन तथा औषधियों में ज्यादा किया जाता है, मगर जितना होना चाहिये उतना नहीं होता है। इस लेख में इस तैल की मुख्य कीमतों का तिरछी गिरानेवाली अनुक्रमणिका (रिफ्रेक्टीव इन्डेक्स) तथा समीकरणों द्वारा अध्ययन किया गया है।