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Application of some available Formulas of Specific Refraction for Edible Oils

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Abstract

Physicochemical study of the edible oils is important parameters. Refractive indices Specific gravity and densities of the edible oils were measured. Abbe refract meter was use to determine refractive index. Density and Specific gravity were estimated by pycnometer. Specific refraction of the edible oils were calculated using Lorentz and Lorenz (L-L) and compare with ADJ, CDJ, GDJ's formula. On comparisons it is observed that all the formulas of specific refraction, accepted for organic compounds are also in good agreements for edible oils.

Keywords: Physicochemical study, edible oils, refractive index, density, specific refraction, Lorentz and Lorenz, Andher Desai and Joshi (ADJ).

Introduction

Edible oils are the integrated part and a key component of Indian foods. Chemically they are the mixtures of triglycerides and other minor components[1]**.** Its versatility and manifold character is not unknown to anyone. They are used for topiary products and cooking media e.g. Shortening, salad dressing, bread dips, frying etc. taste, odor, flavor, color, physical and nutritional importance of oil and fats are depend on their presence of triglycerides[2].

Oil and fats retard digestion, contribute greatly to feeling of satiety, carriers of antioxidant, vitamins and other nutrients, modulate lipoprotein metabolism, help in CNS functioning [3-4].

Refractive indices have a great analytical importance for identification of edible oils. It also shows an index of purity[5] and useful in progress of hydrogenation of oil. Density and specific gravity are not an important parameter for identification of oils but for detailed study of oil and fats especially for the composition and length of chain of fatty acids is important character. With the increasing proportion of long chain fat, refractive index and specific gravity gives anti relation.

Long chain fatty acids show higher refractive index and lower specific gravity. Higher refractive index and specific gravity indicate the proportion of unsaturated fatty acids.

Specific refraction is not a distinguish parameter for edible oil[6] but to check out the application of some available formulas accepted for organic solvents, specific refraction of edible oils are calculated and compared with Lorentz and Lorenz (L and L)[7] equation.

Material and Methods

Seven different types of edible oils were brought from the local market under various brand names. They were brought as one liter plastic pouches, stored at room temperature in laboratory. Refractive index was measured at 30°C on Abbe refractometer. Density and specific gravity were estimated by Pycnometer. Specific refraction of the edible oils were calculated by using Lorentz and Lorenz (L-L) equation and compare with ADJ[8], CDJ[9], GDJ's[10] formula.

Lorentz and Lorenz (L and L)[7] equation of specific refraction is given as under,

$$\frac{n^2-1}{n^2+2}\cdot\frac{1}{d}=R \qquad (1)$$

Where R is the specific refraction, d is density and n is refractive index.

We all ready seen the various specific refraction base research work investigated by various scientists for organic solvents. So it is our try to implement those formulas on edible oils.

Andher Desai and Joshi's (ADJ)[8] formula of specific refraction is given as under,

$$R=\frac{1}{9}\left[\frac{3n-2.47}{d}+0.557\right] \qquad (2)$$

Gadhawala, Desai and Joshi's (GDJ)[10] formula of specific refraction is given as under,

$$R=\frac{1}{0.09}\left[\frac{3n-2.85}{n2+73}.\frac{1}{d}+0.004\right] \qquad (3)$$

Chavda, Desai and Joshi's (CDJ)[9] formula of specific refraction is given as under,

$$\frac{Sin(0.5n - 0.4567)}{d} = R \qquad (4)$$

Calculated values compared with those of Specific Refraction formula.

Results and Discussion

Table-1 indicated the experimental values of Refractive index, Density and the Specific Gravity of the edible oils. Table -2 gives the calculated values of Specific Refraction of Lorentz and Lorenz (R1)[7], Andher Desai and Joshi (R2)[8], Chavda Desai and Joshi (R3)[9] Gadhawala Desai and Joshi (R4)[10]. The data obtained by a little difference confirming that the applicability of suggested formulas is comparable to those of Lorentz and Lorenz formula are in good agreement shown in Table-3. Whereas figure -1 shows the Comparison of different formulas applied for edible oils.

Conclusion

Comparison of different formulas shows that all the formulas of specific refraction applied for organic solvents can be applied for edible oils. Among all the suggested formula CDJ's formula is closest to that of L and L equation. ADJ and GDJ are also acceptable respectively.

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Table-1
Refractive index, Density and Specific Gravity of edible oils

Oils	Refractive Index (R.I.) at 30° C	Density gm/cm^3	Specific Gravity	Specific Refraction L and L Formula
Ground nut oil	1.4662	0.9194	0.9243	0.3013
Cotton seed oil	1.4681	0.9160	0.9209	0.3035
Sun flower oil	1.4704	0.9167	0.9216	0.3046
Soya bean oil	1.4706	0.9143	0.9192	0.3055
Mustard oil	1.4662	0.9174	0.9222	0.3042
Corn oil	1.4694	0.9126	0.9174	0.3054
Rice bran oil	1.4699	0.9189	0.9238	0.3036

Table -2
Compression of L and L, ADJ's, CDJ's and GDJ's Formulas of Specific Refraction

Oils	Specific refraction			
	L and L Formula (R_1)	ADJ's formula (R_2)	CDJ's formula (R_3)	GDJ's formula (R_4)
Ground nut oil	0.3013	0.2950	0.2968	0.2935
Cotton seed oil	0.3035	0.2965	0.2989	0.2953
Sun flower oil	0.3046	0.2972	0.2999	0.2962
Soya bean oil	0.3055	0.2979	0.3008	0.2970
Mustard oil	0.3042	0.2969	0.2995	0.2958
Corn oil	0.3054	0.2979	0.3007	0.2969
Rice bran oil	0.3036	0.2964	0.2989	0.2954

Table-3
Difference between different suggested formulas

Oils	$R_1 - R_2$	$R_1 - R_3$	$R_1 - R_4$
Ground nut oil	0.0063	0.0045	0.0078
Cotton seed oil	0.0070	0.0046	0.0082
Sun flower oil	0.0074	0.0047	0.0084
Soya bean oil	0.0076	0.0047	0.0085
Mustard oil	0.0073	0.0047	0.0084
Corn oil	0.0075	0.0047	0.0085
Rice bran oil	0.0072	0.0047	0.0082

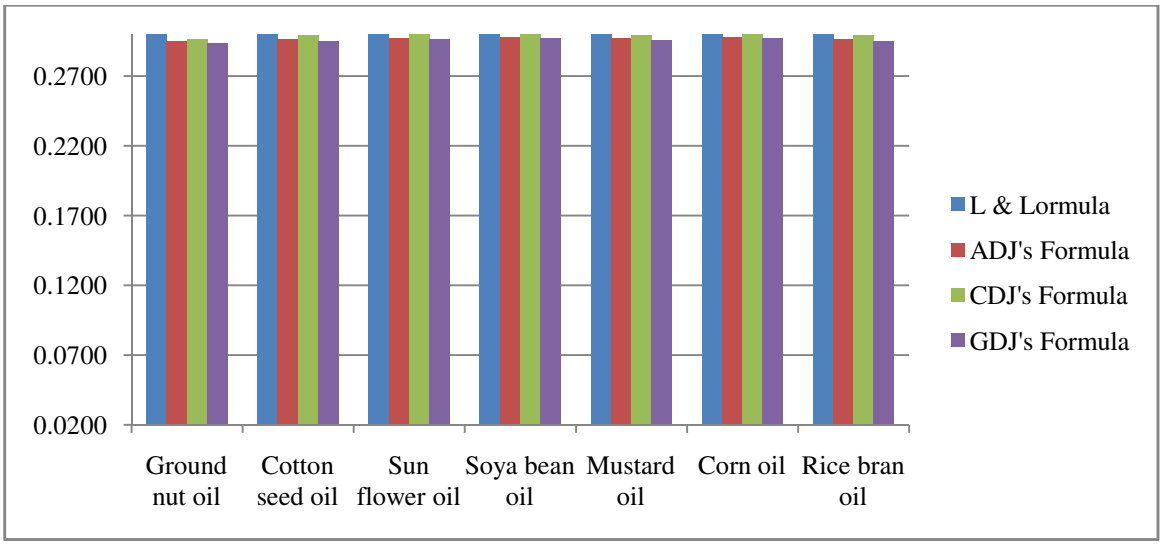

Figure-1
Comparison of different formulas applied for edible oils

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