Colorimetric estimation of Linalool in Coriander

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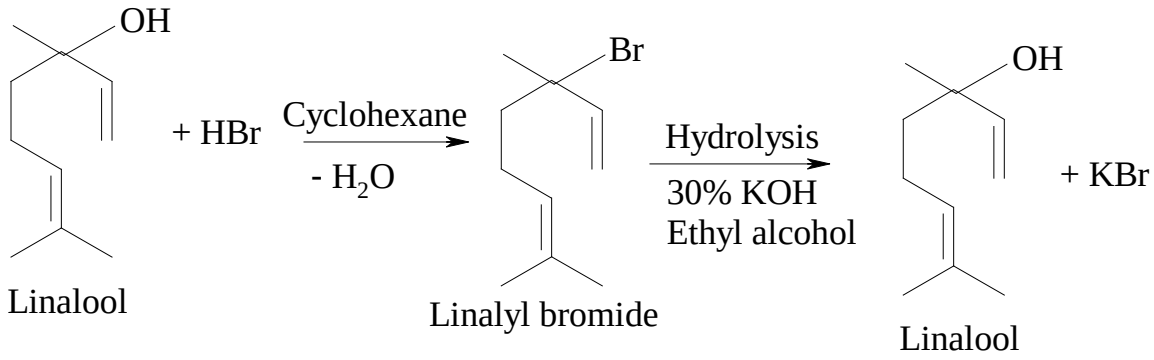
Coriander is a spice due to presence of linalool, an essential oil which is a major component of coriandrol present in coriander. It is extracted from finely powdered dry coriander seeds by steam distillation. The yield is 0.15 to 0.2%. It is a pale yellow liquid with characteristic smell of coriander. It is a mixture of terpenes and terpenoids[1]. Linalool is the major component present up to 70%.

The procedure for the estimation of tertiary alcohol[2] is employed with small modification by using HBr instead of HI in the present estimation. The method is based on the conversion of linalool into its bromide with HBr and thus formed bromide isoxidized quantitatively with potassium bromate to bromine. Bromine is extracted with cyclohexane and the λ_{max} is determined. Absorbance of bromine of different concentrations is measured and standard graph is plotted. Then it is verified by using standard linalool solution and then the amount of linalool in coriandrol is estimated.



$$5KBr + KBrO_3 + 3H_2SO_4 \longrightarrow 3\,Br_2 + 3\,K_2SO_4 + 3\,H_2O$$

Experimental details:

Standard KBr solution (2.5g) is prepared in 250 mL water such that 1 mL contains 10 mg of KBr. Different aliquots of KBrsolution (0.5, 1.0, 1.5, 2.0 mL) in four replicates is taken in separating funnel, diluted to 80 mL with water. 10% H_2SO_4 (10mL), 4% $KBrO_3$ (5mL) and cyclohexane (15mL) are added and shaken well. The liberated bromine goes intocyclohexane layer, which is transferred to 25 mL volumetric flask and made up to mark with cyclohexane. Absorbance of bromine in cyclohexane is measured at 417 nm. A graph of absorbance against concentration of KBr (in mg) is plotted fromwhich the amount of linalool is determined.

Validation of standard curve:

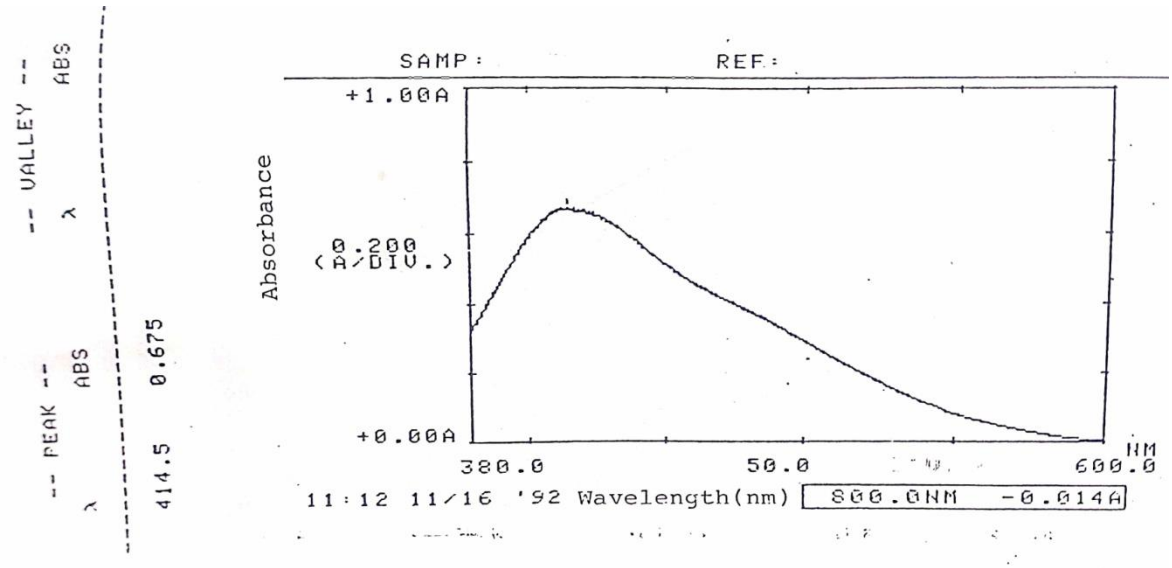
158 mg of linalool is dissolved in 10 mL of cyclohexane. Different aliquots are taken in separating funnel and HBr (3 mL) and cyclohexane (10 mL) are added. The mixture is shaken for 5 minutes and the aqueous layer is discarded. Organic layer is refluxed with 30% KOH (30 mL) and alcohol (10 mL) for half an hour. Then the mixture is cooled and transferred into a separating funnel. KBr and H_2SO_4 are then added and shaken well. The liberated bromine goes into cyclohexane layer which is separated and the absorbance of this solution is measured at 417 nm and concentration is determined from the standard graph is compared with the expected value.

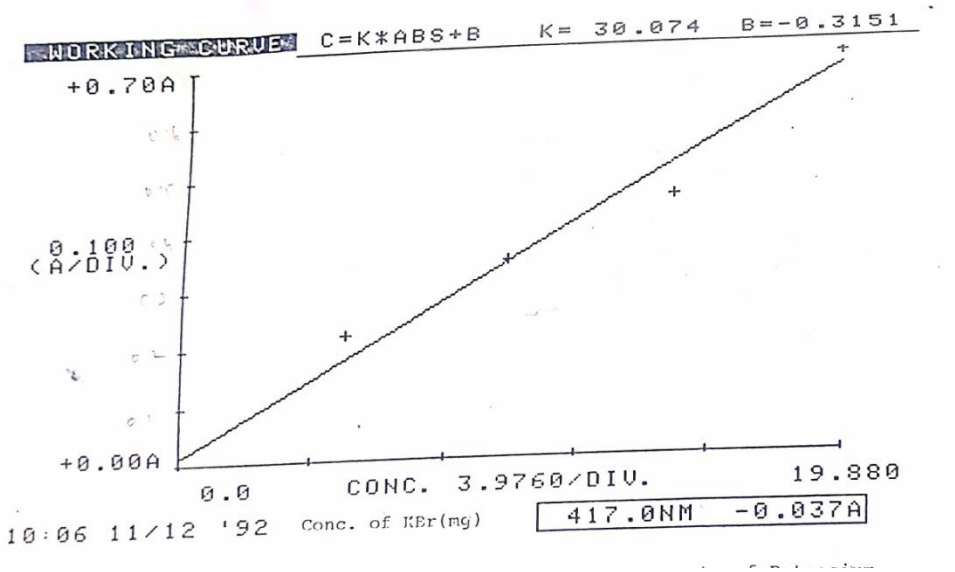
Table-1: validation of standard curve

Weight of linalool (mg per mL)	Absorban ceat 417 nm	Concentration from graph (mg)	% Recovery
7.9	0.180	7.44	94.22
15.8	0.280	15.53	98.32
23.7	0.460	23.10	97.45
		Average	96.66%

Estimation of linalool in coriander:

A known weight of coriandrol (0.2274g) is dissolved in 10 mL of cyclohexane. Different aliquots (0.5, 1.0, 1.5, 2.0 mL) of oil in 4 replicates are taken in a separating funnel and estimated as discussed in the validation of standard curve. From the standard cuve, the amount of linalool in coriandrol is determined.





RESULTS AND DISCUSSION

Absorbance of different concentration of bromine is measured at 417 nm and graph obtained is a straight line passing through origin. The graph is validated using standard linalool of different concentrations. The accuracy of the method is 96.66% showing the accuracy of the method as shown in table-1. The amount of linalool in coriandrol is estimated using the standard curve. From the graph the amount of linalool obtained is about 70 to 72% as shown in table-2.

Table-2: Estimation of linalool in coriandrol:

Weight of oil(mg per mL)	Weight of oil (mg per mL)	Absorance at417 nm	Concentration from graph (mg)	% of oil
0.5	11.37	0.160	6.25	71.16
1.0	22.74	0.325	12.75	72.58
1.5	34.11	0.465	18.50	70.21
			Average	71.32%

Calculation:

The amount of tertiary alcohol in terms of bromine is calculated as follows.1 mL

of solution contains 10 mg of KBr.

119 mg of KBr contains 80 mg of bromine.

1 mg of KBr contains $\left(\frac{80\ x\ 1}{119}\right)$ = 0.6723 mg of bromine.

Since 1 mole of OH groups are replaced by 1 mole of bromine,
80 mg of bromine = 17 mg of OH group.
0.6723 mg of bromine = $\left(\frac{17\ x\ 0.6723}{80}\right)$ = 0.1429 mg of OH.

Hence 1 mg of KBr = 0.1429 mg of tertiary alcohol.

REFERENCES

[1]. State wise production of coriander, export of spices from India, Spices Statistics, 1991, spice board, Kochi, 21-24.[2]. Bradley, M P T and Penketh, G E, Determination of tertiary hydroxyl groups, Analyst, 92, 701-704, 1967.