DETECTION AND QUANTITATION OF CASTOR OIL IN SUNFLOWER OIL

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Abstract

A method has been developed for the detection and quantitation of castor oil in Sunflower Oil by High Performance Liquid Chromatography(HPLC).This method is based on the presence of triricinolein in castor oil and its absence in sunflower oil.

Introduction

Chemical method[1] for the detection of castor oil in other oils by white turbidity with sulphuric acid-ammonium molybdate reagent indicates the likely presence of castor oil. Mahua oil and some varieties of sesame oil also give positive response to this test. For confirmation and quantitation, TLC method has to be followed, which has a sensitivity of 1 percent. Hence, need was felt to develope a method suitable for detection and quantitation of castor oil in other oils. HPLC is a convenient instrument for this.

The separation of triglycerides of sunflower and castor oils by HPLC, using C18 μ Bondapak column and acetonitrile-acetone(2:1)solvent, are reported in literature[2]. From these chromatograms it has been observed that castor oil gives a peak of triricinolein whereas sunflower oil does not give such peak. This observation forms the basis for the detection and quantitation of castor oil in sunflower oil. In the present investigation triglyceride column and acetonitrile-tetrahydrofuran (3:1) solvent were used. Results of investigations alongwith the limitations are reported in this paper.

Materials and Methods

Synthetic blends were prepared by mixing 0.25%, 0.5%, 1%, 2%, 3%, 4% and 5% castor oil in refined sunflower oil. Refined sunflower oil, castor oil and synthetic blend samples were made as 20% solutions in acetone. Chromatographic runs were performed with a Waters Associates Liquid Chromatograph model ALC/GPC-244 equipped with a 7.8 mm I.D. x 30 Cm stainless steel triglyceride column having prefilter. Samples were injected by means of a U 6 K septumless loop injector. The waters differential refractometer R 401 was used as a detector. Samples were run isocratically using a mixture of acetonitrile-THF (3:1) at ambient temperature. The operating conditions were : flow rate, 2 mL/min; sample size, 3 mg (15μLof 20% solution), attenuation, 4X; chart speed, 0.4"/min;pressure, 900 psig. All the components were eluted within 20 minutes requiring 40 ml solvent. Sunflower oils having FFAs 1% and 2% and oxidised oils having peroxide values 50 and 300 were also run under the above conditions to see if these interfere with the triricinolein peak.

Results

Chromatograms are given in figures 1-3. Peak heights of triricinolein peak were measured and plotted against castor oil percentage (Fig.4).

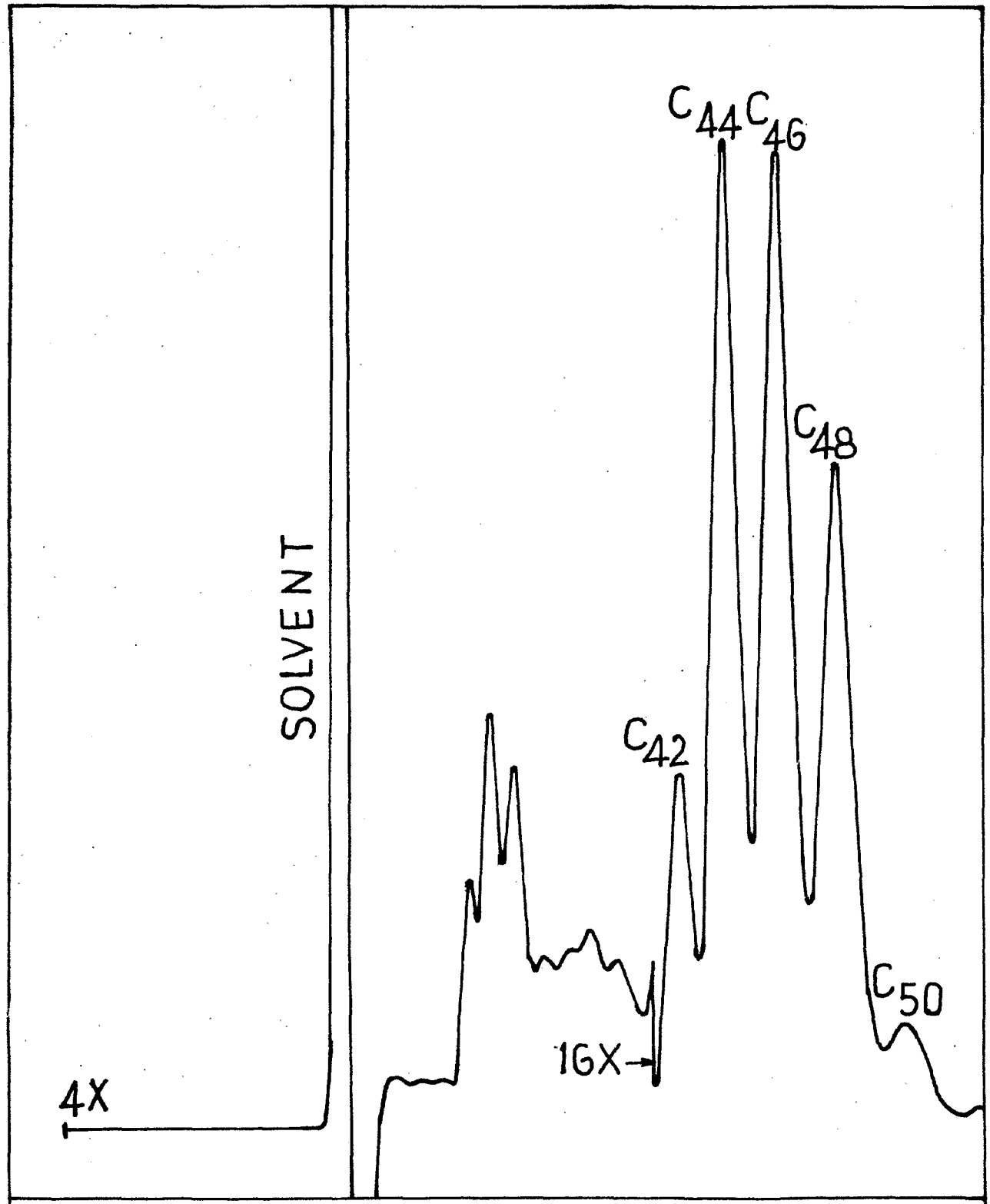

FIG. 1. HPLC OF SUNFLOWER OIL

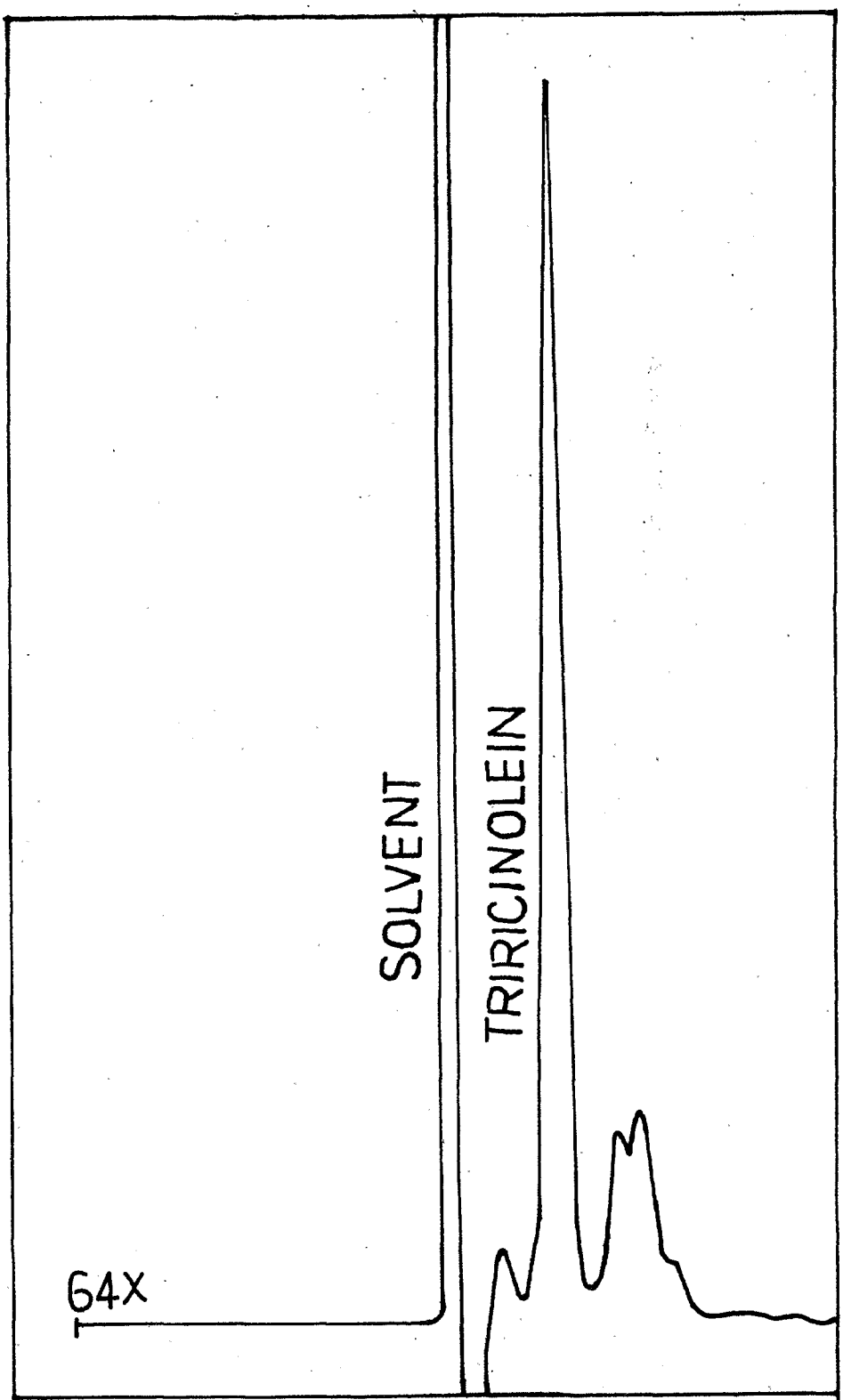

FIG. 2. HPLC OF CASTOR OIL

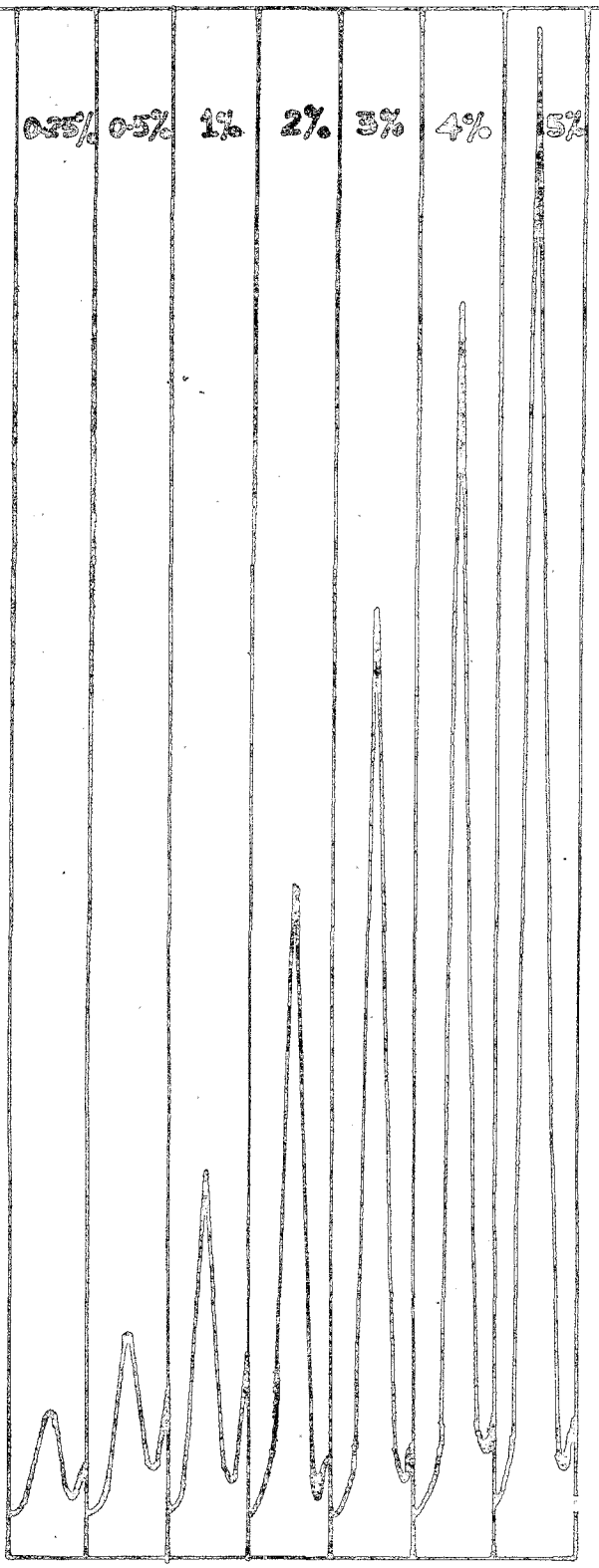

FIG. 3. TRIRICINOLEIN PEAK HEIGHTS AT DIFFERENT LEVELS OF CASTOR OIL IN SUNFLOWER OIL

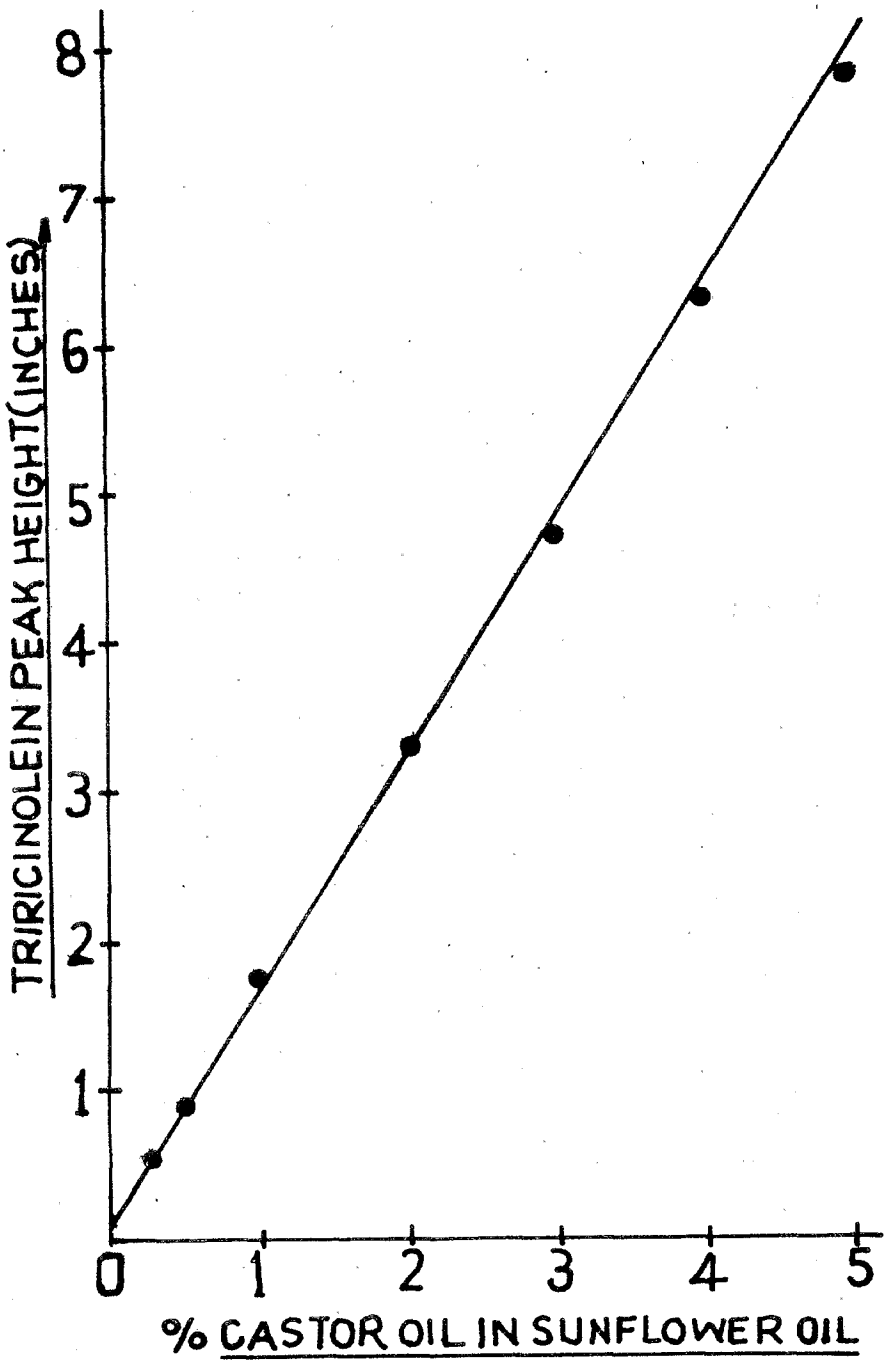

FIG. 4. PLOT OF % CASTOR OIL IN SUNFLOWER OIL VS. TRIRICINOLEIN PEAK HEIGHT

Discussion

On comparing the chromatograms of sunflower and castor oils in Fig.1 and 2, we find that castor oil chromatogram has characteristic peak representing triricinolein whereas sunflower oil does not have. This forms the basis for the detection of castor oil in sunflower oil. Triricinolein peak has the retention time of 7 minutes. Thus, detection of castor oil in sunflower oil can be done very conveniently in this manner.

We observed that triricinolein peak height increases gradually as the castor oil content in sunflower oil increases from 0.25% to 5%(Fig.3), while in pure sunflower oil this peak is absent. The plot of triricinolein peak height Vs percentage of castor oil in sunflower oil is linear (Fig.4). The data of peak height and castor oil percentage in the blends was processed statistically and a straight line could be fitted for the same (Fig.4).

Castor oil percentage can be obtained diretly from this plot for triricinolein peak height of any unknown sample run on HPLC. This analysis takes about 20 minutes. This method can be conveniently used for finding the composition of blends and checking the adulteration/contamination.

We have observed that sunflower oil samples having peroxide value (P.V.) upto 50 can be tested successfully by this method. If the samples are old and oxidised and the P.V. is very high then this method fails because the degradation products interfere with the triricinolein peak.

We have also observed that FFAs in sunflower oil give peaks interfering with the triricinolein. Hence oils having more than 0.2% FFA should be given a caustic wash before analysis.

Conclusions

Detection and quantitation of castor oil in sunflower oil can be done conveniently by the above HPLC method subject to the limitations mentioned above.

References

1. - 1976 Methods of sampling and Test for Oils and Fats I.S.548 (Part II), India Standards Institution, India.

2. PLATTNER, R.D.,SPENCER, G.F., and KLEIMAN, R. 1977. Triglyceride Separation by Reverse Phase HPLC. J.Am.Oil Chem. Soc 54, 511.