



# DETERMINATION OF $\alpha$ -TOCOPHEROL ACETATE PRESENT IN COMMERCIAL HERBAL AND SYNTHETIC COSMETIC SKIN CREAMS BY GRADIENT HPLC

Dolas Ashadevi S.<sup>1</sup> and Dr. Gotmare Sulekha R.<sup>2</sup>

<sup>1</sup> Ph.D Scholar, Department of Analytical Chemistry, S.N.D.T. Women's University, Mumbai, Maharashtra - 400049, India

<sup>2</sup> Associate Professor, Department of Analytical Chemistry, S.N.D.T. Women's University, Mumbai, Maharashtra - 400049, India

**Abstract:** Antioxidants retard toxic effect of free radicals which can cause skin problems. Hence synthetic and herbal creams incorporate antioxidants like  $\alpha$ -tocopherol acetate in their formulations.  $\alpha$ -Tocopherol acetate not only acts as an antioxidant but also prevents oxidation and rancidity of fat and oil-based creams. Determination of  $\alpha$ -tocopherol acetate is a tedious task as its extraction requires a special procedure due to the presence of large number of ingredients in the matrix. In this paper, concentration of  $\alpha$ -tocopherol acetate in various types of commercial synthetic and herbal skin creams were calculated through extraction by gradient HPLC.

**Key Words:** Antioxidants, cosmetic creams, gradient HPLC,  $\alpha$ -Tocopherol Acetate

## Introduction:

The Indian cosmetic market has evolved tremendously over the years and today there is an abundance of choice for consumers. The category offers a wide variety of skin creams to choose from. Usage of Herbal cosmetics is a modern trend and consumers tend to prefer cosmetics which are made up of natural botanicals. The natural content in herbs is free from any harmful chemical side-effects; (Laxmi et al., 2015, Shweta et al., 2011) & on the other hand synthetic creams are also using innovative techniques to retain their position in the market.

Exposure to UV-light, pollution, poor diet, smoking, stress etc. are promoting formation of free radicals which can cause skin problems (Chinwe, 2015, Ahmed, 2014). Antioxidants are such a molecule which has ability to fight against free radical and their deleterious effect (Lobo et al., 2010) therefore more and more people are including antioxidant rich food in their diet. Cosmetic companies are also taking advantage of this property and incorporating various antioxidants in their formulation. Antioxidants retards the process of oxidation and rancidity of fat and oil hence acts as a preservative antioxidant. In cosmetics they mainly considered as reducing agent and scavengers of free radicals (Anca et al., 2011). Herbal skin creams and synthetic creams both use  $\alpha$ -tocopherol acetate in their skin care formulation instead of synthetic antioxidants like BHA (Butylated Hydroxyanisole) and BHT (Butylated Hydroxytoluene) which may be carcinogenic if used extensively and also cause allergic reaction in the skin (Laxmi et al., 2015, Anca, 2011). Over the counter skin creams are cost effective and easily available (Nada et al., 2012). The most favorite among consumers are fairness creams, moisturizers and anti-aging creams whether it is herbal or synthetic. Fairness creams have always dominated the Indian market as everyone aspires to get a fair skin tone (Anitha et al., 2018). Moisturising cream is a need of skin as it keeps the skin hydrated, smooth and soft. Moisturisers prevent our skin from becoming dry, it acts as a skin barrier and also restricts water evaporation. This helps in ensuring that our skin moisture is maintained and improved (Fabrizio et al., 2018). Anti-aging creams are slowly becoming popular as everyone has a desire to look young (Amy et al., 2010).

The matrix of cosmetic skin cream is highly complex which contain large number of ingredients with different functional groups, (Anca et al., 2011) in such a condition it's very difficult to separate any particular ingredient especially  $\alpha$ -tocopherol acetate from matrix. Chromatographic techniques are quite suitable for determination of antioxidant like  $\alpha$ -tocopherol acetate (Anca 2011, Anca et al., 2012).

## Material and Methods:

All reagents used were of analytical grade and used without further purification.

$\alpha$ -Tocopherol Acetate (Sigma Aldrich), Tetrahydrofuran HPLC grade (S.D. Finechem), Acetic Acid (Fischer Scientific), Acetonitrile HPLC grade (Ranchem), Methanol HPLC grade (Ranchem)

### Commercial Cosmetic Products:

Six commercial cosmetic skin creams (3- Herbal and 3-Synthetic) and two expired creams (1-herbal and 1-synthetic) were purchased from retail pharmacies in Navi Mumbai, India. All creams were containing  $\alpha$ -tocopherol acetate without specifying its quantity. Details of the creams are mentioned below.

**Table 1. List of samples containing  $\alpha$ -Tocopherol Acetate**

Sample	Abbreviation	Sample	Abbreviation
Synthetic Moisturising Cream	SA	Herbal Moisturising cream	HA
Synthetic Fairness Cream	SB	Herbal Fairness Cream	HB
Synthetic Anti-aging Cream	SC	Herbal Anti-aging Cream	HC
Expired Synthetic Anti-aging Cream	EXP.SC	Expired Herbal Anti-aging Cream	EXP. HC

### Instrumentation:

Sonication performed on Smita Scientific Sonicator. Chromatography performed on Agilent Poroshell 120 EC-C 18 (3.0 mm x 50 mm x 2.7  $\mu$ m) equipped with DAD detector.

### Chromatographic Condition:

The composition of mobile phase A: Water: Tetrahydrofuran with 0.05% Acetic acid (95:5 v/v). The composition of mobile phase B: Acetonitrile: Methanol: Tetrahydrofuran with 0.035% Acetic acid (75: 25: 5 v/v). Samples 20  $\mu$ l injected, column temperature was 45°C and the flow rate was 1.0 ml/min and detection was performed at 290 nm. Chromatography performed at ambient temperature.

### Sample Preparation:

Weigh 500 mg of sample in 10 ml of standard volumetric flask. Add 5-7ml of extraction solvent (mobile Phase B) and keep it in ultrasonication bath for 20 minutes. Dilute upto the mark with same extraction solvent (mobile phase B) and filter through 0.45  $\mu$ m nylon filter.

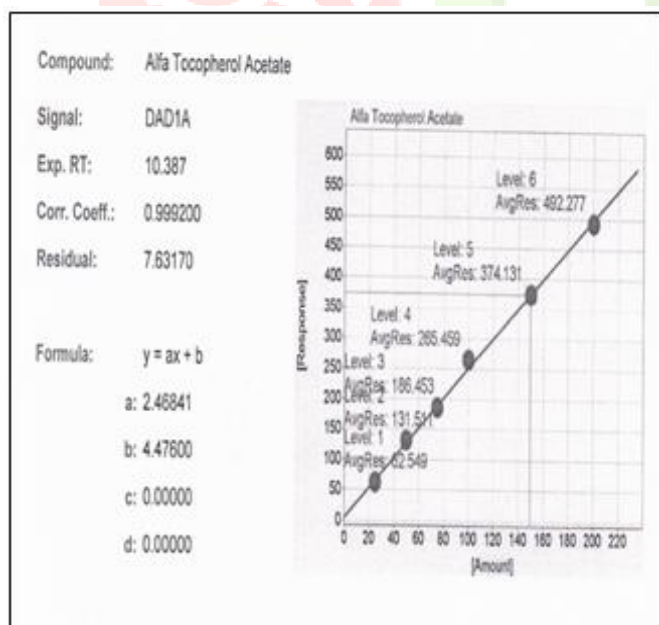
### Standard Preparation:

10 mg of standard diluted with 10 ml of extraction solvent (mobile phase B) and prepared a series of concentration ranging from 25 ppm to 200 ppm.

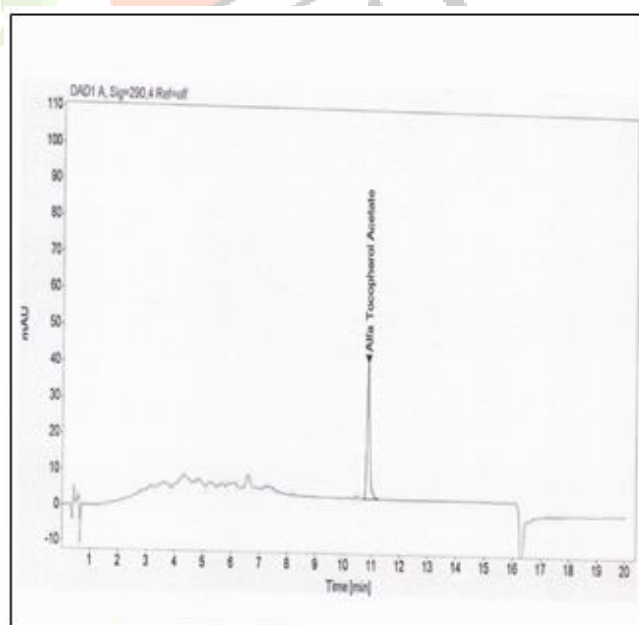
### Gradient Time:

Time in Min./ Phase	0	3	8	15	15.1	20
Mobile Phase A	70	25	0	0	70	70
Mobile Phase B	30	75	100	100	30	30

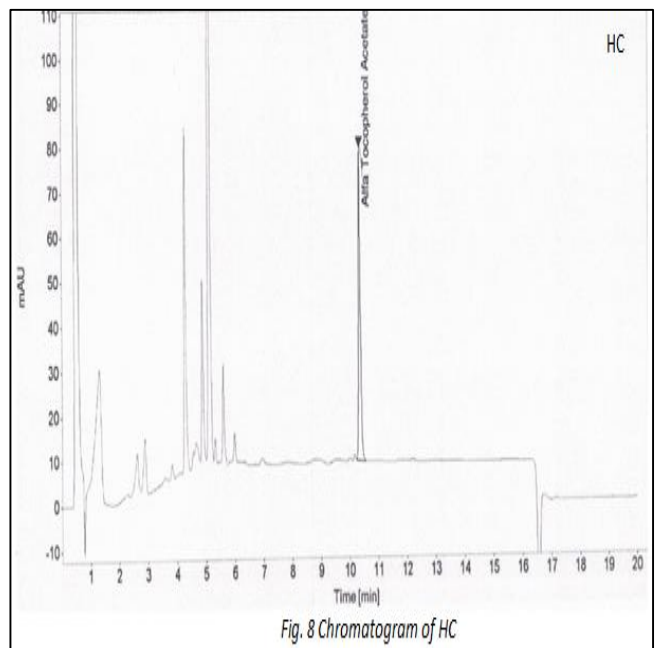
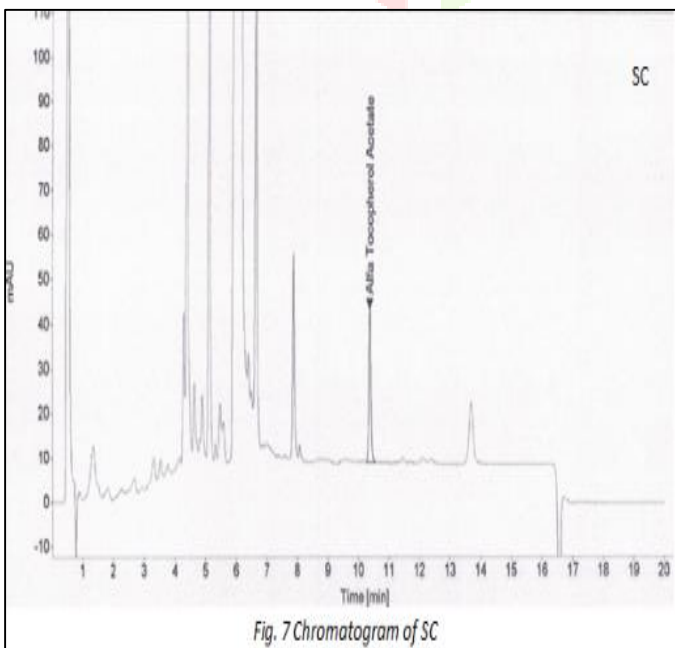
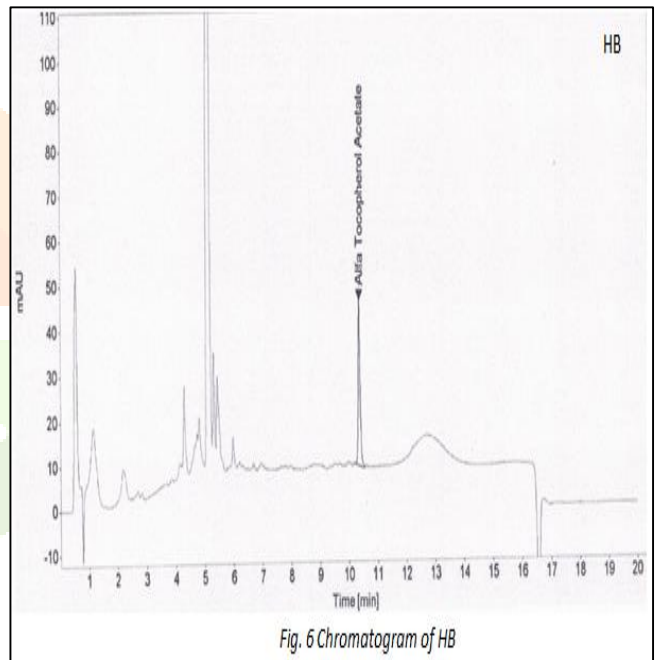
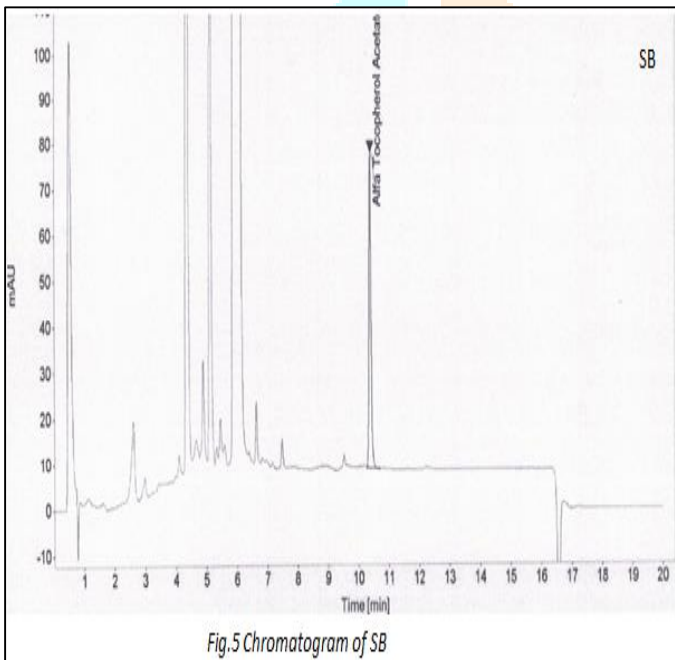
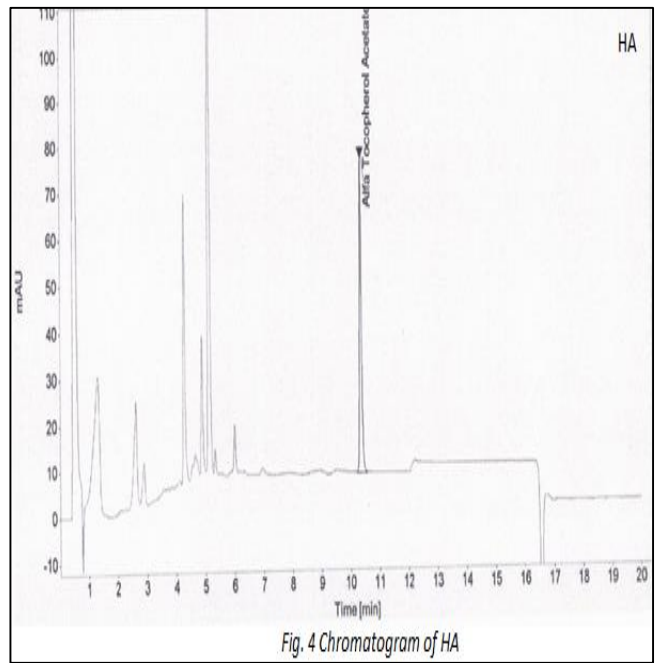
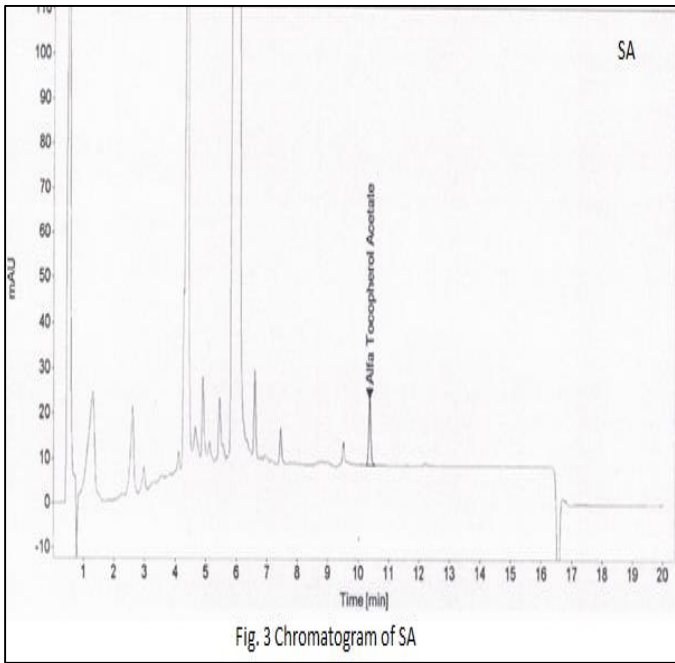
**Results and Discussion:** Fig. 1 shows calibration graph of standard and Fig. 2 represents chromatogram of standard  $\alpha$ -tocopheryl acetate at 100ppm



**Fig. 1 Calibration graph**



**Fig. 2 Chromatogram of standard at 100 ppm**



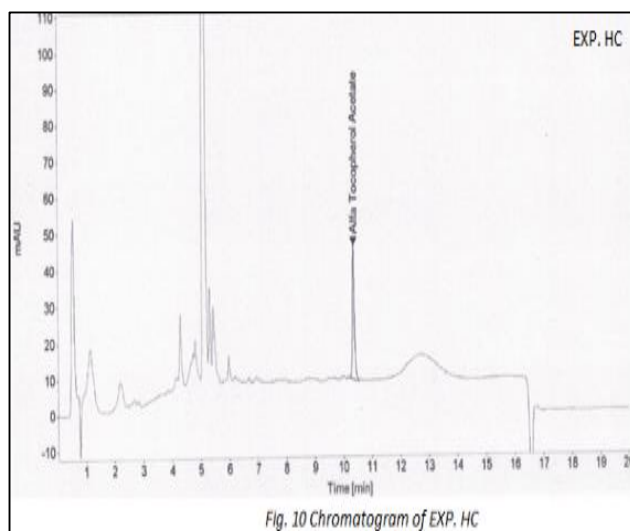
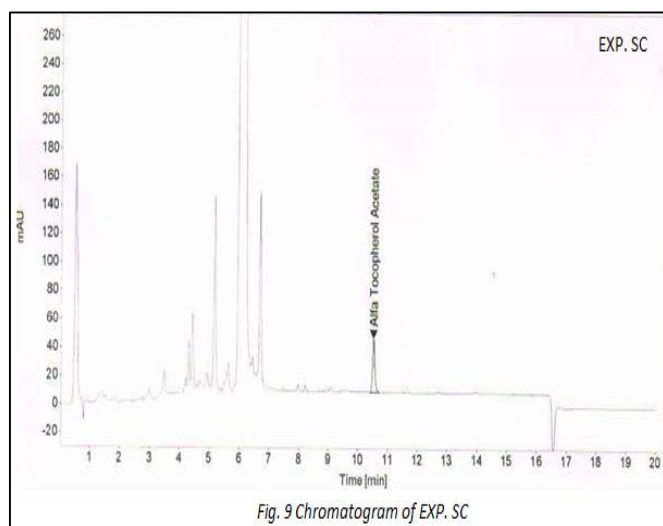


Fig. 3, 4, 5, 6, 7 and 8 are respective chromatograms of SA, HA, SB, HB, SC, HC. Chromatogram of EXP SC and EXP. HC are represented by Fig. 9 and 10. Concentration values of  $\alpha$ -tocopherol acetate in cosmetic creams mentioned in Table 1

**Table 2 concentration of  $\alpha$ -tocopherol acetate in synthetic and herbal cosmetic cream**

Name of Sample	Concentration in %	Name of Sample	Concentration in %
SA	0.042	HA	0.18
SB	0.200	HB	0.11
SC	0.099	HC	0.20
EXP. SC	0.095	EXP. HC	0.11

#### Conclusion:

Antioxidant is one of the most common ingredients of cosmetic creams especially  $\alpha$ -tocopherol acetate which is present in most of the herbal as well as synthetic creams. Generally, fairness creams, moisturisers and anti-aging creams are favorites among consumers whether it is synthetic or herbal. In the above study all the three forms of creams i.e. moisturising creams, fairness creams and anti-aging creams of herbal and synthetic were studied by gradient HPLC method. From the above values we may conclude that in synthetic creams the overall concentration of  $\alpha$ -tocopherol acetate is quite less than herbal creams, especially in SA where its value is less than expired creams like EXP. SC and EXP. HC.

The above method is simple, accurate, rapid and suitable for extraction, identification and estimation of  $\alpha$ -tocopherol acetate in cosmetic skin creams.

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