THE EFFECT OF SOME AROMATIC CHEMICALS AND ESSENTIAL OILS UPON THE STABILITY OF COSMETIC EMULSIONS*

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IN THE COURSE OF several years' experience in manufacturing emulsions, it was found that the liquid emulsions of the O/W type behaved irregularly regardless of the rigid control of all ingredients except perfume. This effect could not be explained otherwise than to blame the perfume. It is generally known that perfume is quantitatively the smallest item in every cosmetic formula, its amount usually being 1 per cent or even expressed in the form *q. s.* (quantity sufficient) and is given last in the formula. Since the importance of a good cosmetic emulsion is evident, even the smallest item of the formula should not be overlooked in order to obtain satisfactory results.

In recent years many new ingredients have been presented to the cosmetic industry with technically elaborate data. However this data, as helpful as it is in improving the manufacture of emulsions, does not consider the entire specific task. For instance, none of this helpful data considers the effect of perfume upon the stability of emulsions. In emulsion literature, no one, to the author's knowledge, has pointed out sufficiently the action of perfume upon the stability of emulsions. In dealing with food emulsions, Corran (2) stated that the flavoring of mayonnaise does not exert any effect upon the persistence of emulsions. Berkman and Egloff (1), however, pointed out that the stability of an emulsion is determined by the coincidental action of various factors, such as the type of dispersion, temperature, pH values, viscosity, preservation, electrolytes, etc. Jannaway (3), writing on the stability of cosmetic emulsions, stated more specifically that all of the constituents of an emulsion should be carefully considered. After this clear statement by a cosmetic specialist, one would expect to find some reference to perfume. Furthermore, the same author, in writing on the perfuming of toilet preparations, considers many aspects of good cosmetic emulsions but not their stability in regard to perfume. He and others stressed the irritation of the skin by per-

* Presented at the May 20, 1949, Meeting, New York City.

fume, the discoloration of cosmetics, their preservation, the lasting quality of perfume, and other subjects; but there is no mention of the action of perfume on the stability of emulsions.

Let us now consider the effect of that last but not least important ingredient in the formula, perfume. It was noticed that the emulsions were superior when the perfume ingredients were controlled with care. By changing the ingredients in compounding the perfume or by having them supplied by an outside firm, the emulsions were thus often rendered unsatisfactory. In view of this fact, several experiments were performed which are outlined in the following discussion. Five different types of emulsions were made, and the effects upon them of 11 aromatic chemicals and 10 essential oils were studied.

In the following discussion, the word "separation" is synonymous with the word "breaking."

Summary of Experiments

To make the emulsions, the ingredients were those most commonly used in the cosmetic industry. The emulsion was the liquid O/W type made with surface-active agents and also two emulsifiers of natural origin, all favoring O/W emulsions. These emulsifiers were as follows:

1. Triethanolamine Stearate
2. Castile soap, powdered
3. Duponol ME (sodium lauryl sulfate)
4. Lecithin soybeans (phospholipid)
5. Gum Arabic (pentosan colloid)

The oils used were mineral and sesame. The aromatic chemicals and essential oils listed below were added separately to the five above emulsions. In so doing, 115 experiments were performed (21 perfuming ingredients added separately to each of the five emulsions thus resulting in 105 experiments and 10 controls not perfumed). In the dispersion of the oils, laboratory high speed Epenbach colloidal mills were used.

Aromatic Chemicals

1. Phenylethyl Alcohol
2. Hydroxycitronellal
3. Terpineol
4. Benzyl Acetate
5. Linalyl Acetate
6. Geraniol
7. Linalool
8. Benzyl Alcohol
9. Methyl Ionone
10. Amylcinnamic Aldehyde
11. Methyl Anthranilate
12. Control not perfumed

Essential Oils

1. Geranium
2. Bergamot
3. Lavender
4. Orange (sweet)
5. Patchouly
6. Vetivert (Bourbon)
7. Sandalwood
8. Neroli (Bigarade)
9. Rose de Mai
10. Ylang Ylang
11. Control not perfumed

Experiment I—Emulsions with Triethanolamine

50 gm. Triethanolamine
150 gm. Stearic Acid (triple-pressed)
3000 cc. Distilled Water

These three ingredients were saponified by bringing the temperature to 100°C. for one hour. After this had been done, the final emulsion was made with the following:

300 cc. of the above solution
100 cc. Mineral Oil (sp. gr. 0.845–0.855)
100 cc. Sesame Oil
5 cc. Aromatic chemicals or essential oils

After dispersion for 15 minutes, each of the prepared 100-cc. emulsions was put aside for observation. Immediate separation was noticed with Phenylethyl Alcohol and Hydroxycitronellal. After five days breaking occurred with Linalool, Amyl cinnamic Aldehyde, Terpineol, and Methyl Ionone. In the case of Methyl Anthranilate, discoloration appeared on the top of the emulsion; and only slight creaming took place.

In using essential oils in the same manner, breaking occurred in the following order: the first to separate was Rose de Mai; second was Geranium; third was Lavender and Sandalwood; fourth was Neroli; and fifth was Ylang Ylang. After four days, emulsions with Bergamot, Orange, Patchouly, and Vetivert did not separate. The controls without perfume remained stable for five days.

Experiment II—Emulsions with Castile Soap

300 cc. Soap and water solution (294 cc. distilled water and 6 gm. powdered soap)
100 cc. Mineral Oil
100 cc. Sesame Oil
5 cc. Aromatic chemicals or essential oils

These ingredients were dispersed and stored as before. After one day's standing with Methyl Anthranilate, the oil floated to the top; creaming occurred, and there was a yellow coloration. After two weeks the oil separated from the water in all samples. In general, soap was found to be satisfactory as an emulsifying agent for all synthetic chemicals with the exception of Benzyl Alcohol which destroyed the emulsion. The soap emulsions with the essential oils lasted for more than 24 hours. The control without perfume withstood breaking for five days.

Experiment III—Emulsions with Duponol

300 cc. 0.5% Duponol ME water solution
100 cc. Mineral Oil
100 cc. Sesame Oil
5 cc. Aromatic chemicals or essential oils

After dispersion, the effects noted were as follows:

In all cases the Duponol solution produced slow breaking. After two hours, the sample with Hydroxycitronellal was slightly separated; and after two days, there was complete separation. The experiments with essential oils resulted in satisfactory stability. The emulsions were as stable as the control. Consequently the essential oils did not produce any noticeable effect upon the stability of the Duponol emulsions.

Experiment IV—Emulsions with Lecithin

100 cc. Mineral Oil
90 cc. Sesame Oil
10 gm. Lecithin soybean dissolved at 70°C. in the two oils
300 cc. Distilled water
5 cc. Aromatic chemicals or essential oils

The emulsions with Phenylethyl Alcohol and Hydroxycitronellal were superior and lasted for five days. Emulsions with Linalyl Acetate, Geraniol, Linalool, Benzyl Alcohol, and Methyl Ionone were only stable for two days. Separation was immediate with Amyl Cinnamic Aldehyde and Methyl Anthranilate. The emulsion with Bergamot lasted five days as long as the control. The samples with other essential oils were stable only for two days.

Experiment V—Emulsions with Gum Arabic

300 cc. 5% Gum Arabic water solution
100 cc. Mineral Oil
100 cc. Sesame Oil
5 cc. Aromatic chemicals or essential oils

After emulsification, immediate separation was noted with Hydroxycitronellal and Benzyl Alcohol. Discoloration occurred with Methyl Anthranilate, and creaming was observed. Amyl Cinnamic Aldehyde and Methyl Ionone separated after three days. The emulsions in the controlling bottle lasted five days. The essential oils did not cause separation of emulsions with Gum Arabic.

EXPLANATION OF TABLE 1

1. Emulsions with Triethanolamine Stearate without aromatic chemicals lasted five days. With the addition of Phenylethyl Alcohol, Hydroxycitronellal, and Geraniol, their life was short, less than one hour. With the remaining aromatic chemicals, the emulsions stood for five days. Note the shortening of the life of the emulsions under the effect of the three chemicals.

2. The life of the emulsions with soap was lengthened from two to more than seven days by all the aromatic chemicals except Benzyl Alcohol and Methyl Anthranilate.

3. The life of the Duponol emulsions was shortened to two days in comparison with four days in the case of the control. The Hydroxycitronellal separated the emulsion after two hours. The life of this emulsion was shortened to two days with Linalyl Acetate, Geraniol, Linalool, Benzyl Alcohol and Methyl Ionone. No effect was observed with Phenylethyl Alcohol and Hydroxycitronellal.

4. The Gum Arabic emulsions were broken by Hydroxycitronellal and Benzyl Alcohol.

EXPLANATION OF TABLE 2

1. The life of the Triethanolamine emulsions with Geranium, Lavender, Sandalwood, and Rose de Mai was short, lasting only two hours. This is similar to the aromatic chemicals of a rose character such as Phenylethyl Alcohol, and Geraniol.

2. The soap emulsions with most

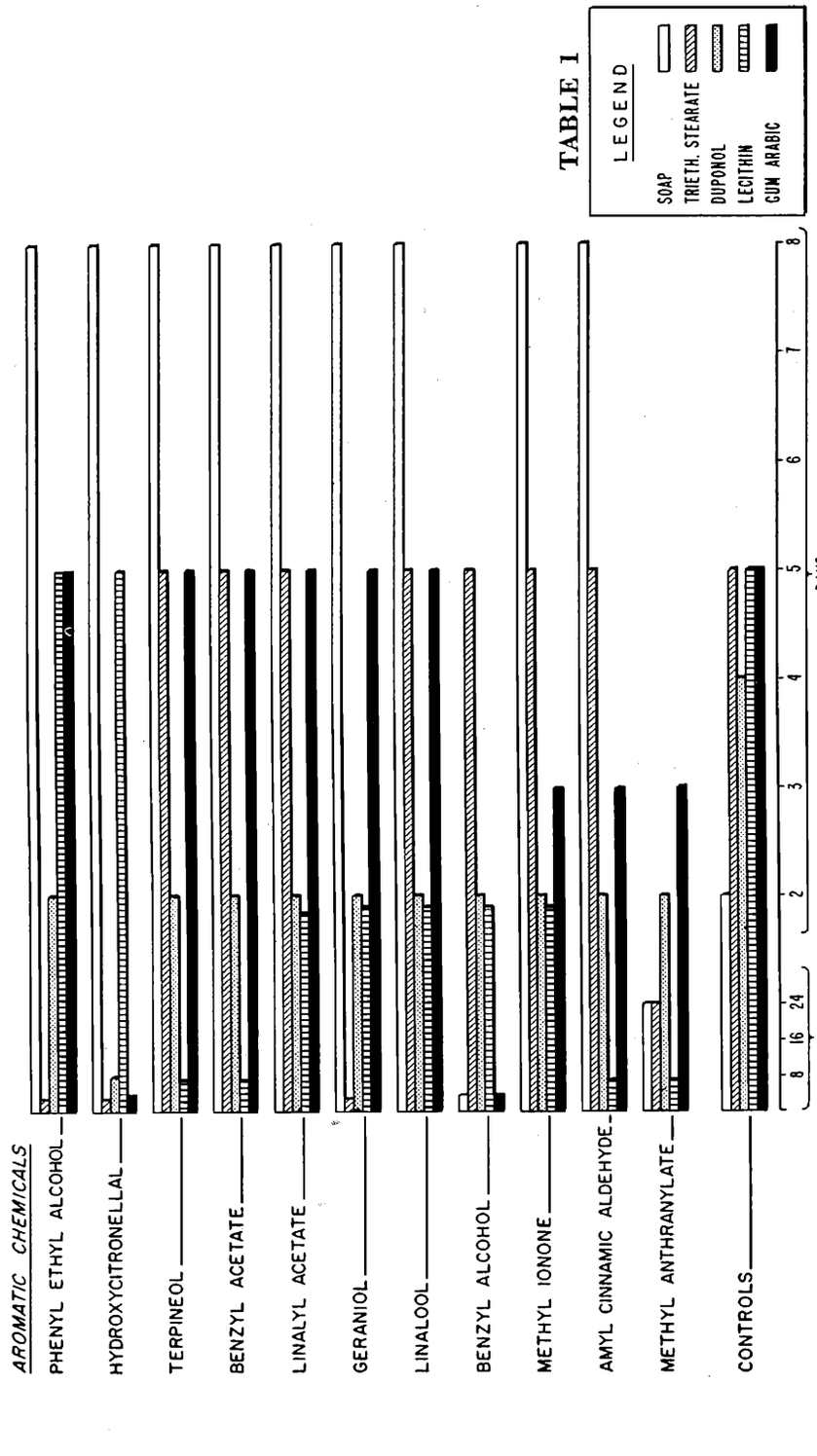
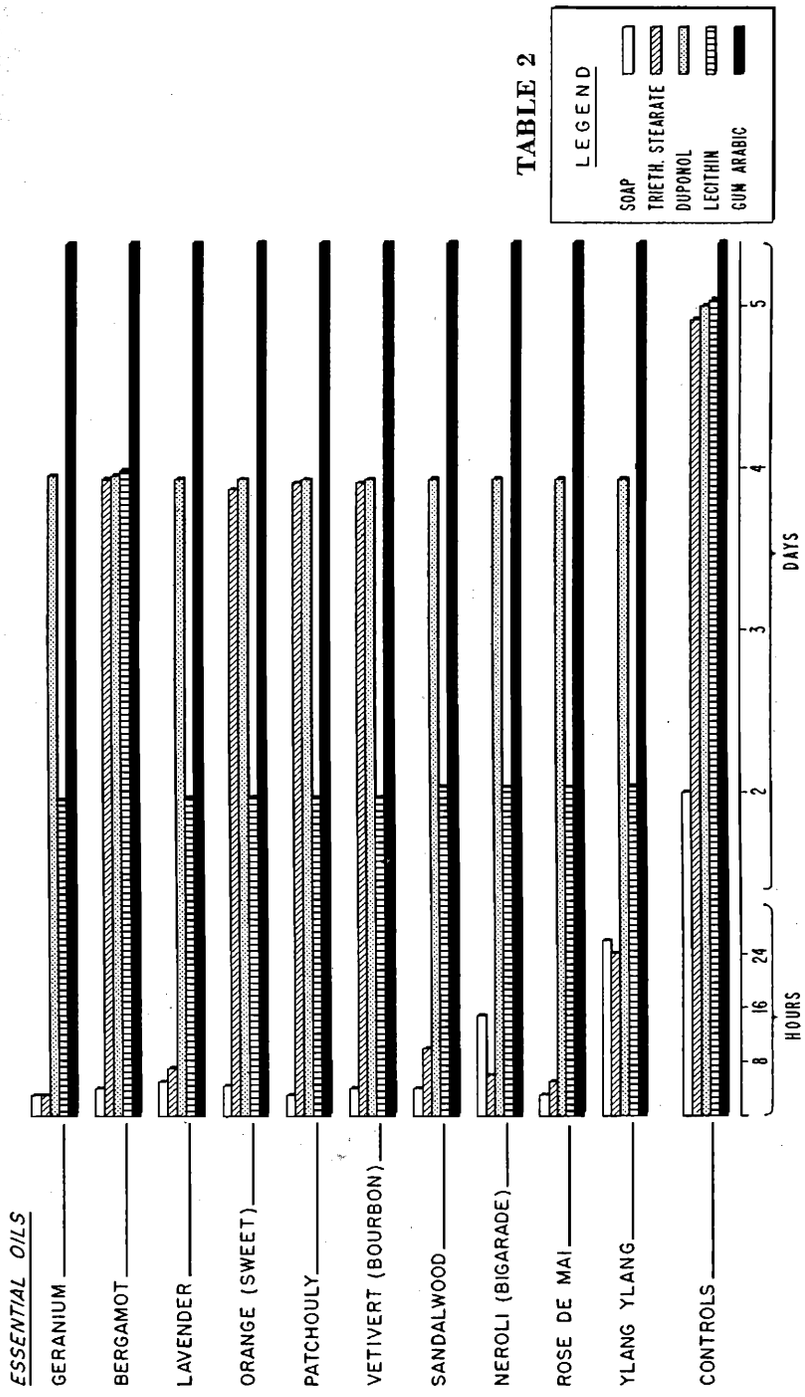


TABLE 2



of the essential oils were unstable contrary to those with aromatic chemicals. The life of the soap emulsions was shortened from two days to less than one hour.

3. The emulsions with Duponol were not affected by the essential oils under consideration.

4. The emulsions with Lecithin were somewhat less stable than the control.

5. The essential oils did not affect the Gum Arabic emulsions.

Discussion

In common practice, the compound for perfuming the emulsions is always a mixture of 50–75 per cent aromatic chemicals and 25–50 per cent essential oils. However, sometimes only one or a few aromatic chemicals or essential oils are used. Because of the variety of the character of the perfuming ingredients, one ingredient may disturb the emulsion; the other may tend to stabilize it with the result that emulsion stability has not been affected. But this is a very rare coincidence on which the technician should not count. The experiments performed show that the matter is more complicated because of the great variety of the emulsifiers as well as of the ingredients of the cosmetic emulsions. The safest recommendation is to study the ingredients of the perfume used especially when the liquid-type emulsion is made. There is an obstacle, however, in the practical application of this recommendation because the perfumes are often being supplied by outside concerns which naturally consider the composition of their products a trade secret. Consequently this point will involve much controversy.

Conclusions

1. It can be stated that in most of the experiments, both aromatic chemicals and essential oils had a varied effect on all five types of emulsions by often shortening but less frequently lengthening their life.

2. It seems that the rose character of both aromatic chemicals and essential oils was destructive to the Triethanolamine emulsions.

3. Hydroxycitronellal is most destructive to the three types of emulsions.

Bibliography

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