Quality factors in lavandin

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A hybrid between lavender and spike lavender, lavandin was neither recognized as a discrete plant nor commercially distilled until about 1925. Today more than 1000 metric tons of lavandin oil is distilled annually, primarily in France, compared to approximately 100 metric tons of the oils of each of the parent plants. The most extensively cultivated strains of lavandin are Abrialis and Super,* although some Maime and Gros Bleu are also grown for essential oil production. Recently a fertile hybrid was discovered, but to date no commercial plantings have been reported. Despite its obvious importance to perfumery and its standing as one of the world's most important essential oils, relatively little has been written about lavandin oil or the evaluation of its quality.

The most definitive work to appear on this subject is included in "Etudes sur la lavande," which has been serialized in the Roure Bertrand Dupont publication *Recherches*.[1] In addition to scholarly and informative discussions concerning cultivation, ecology, quality zones, and crop failure, Vinot and Bouscary examined in detail the distinction between lavender and the different varieties of lavandin as portrayed by their optical activity. The mean values set forth in Table I were compiled from this work.

In 1960 the Essential Oil Association published physical and chemical specifications for lavandin Abrialis, portions of which appear in Table II.[2]

TABLE I

TYPICAL MEAN VALUES OF LAVANDIN OIL[1]

Type	Specific Gravity, 20°C	Optical Rotation, 20°C	Refractive Index, 20°C	Ester Content
Abrialis	0.890	-3.46°	1.4623	30.6%
Fertile	0.896	-3.25°	1.4621	33.0%
Gros Bleu	0.885	-6.40°	1.4632	22.1%
Maime	0.883	-8.26°	1.4623	22.2%
Super AA 58	0.894	-4.71°	1.4586	43.7%
Super B	0.890	-7.44°	1.4581	46.2%
Super A	0.889	-7.95°	1.4580	48.9%
Super	0.888	-8.17°	1.4578	49.0%

TABLE II

E.O.A. SPECIFICATIONS FOR LAVANDIN ABRIALIS[2]

Specific Gravity, 25°C	0.885 to 0.893
Optical Rotation, 25°C	-2° to -5°
Refractive Index, 20°C	1.4605 to 1.4640
Ester Content	28% to 35%

However, application of these standards alone is not sufficient for determining either quality or acceptability. In fact, samples of lavandin Abrialis with a camphor content exceeding 10 percent often fall within the EOA limits but rate poorly in organoleptic evaluations. Also, samples of a high olfactory quality may fall outside these limits.

It has been observed, nonetheless, that analyses of lots selected for fragrance compounding reveal certain limiting physical and chemical characteristics. In the case of lavandin Super, for which there is no published EOA specification, samples with an ester content of less than 40 percent, a refractive index greater than 1.4600, or optical activity less than -6.65° are generally rated organoleptically inferior.

From 1971 through 1976 approximately 30 different commercial samples† have been evaluated an-

* The term Super generally encompasses the strains Super, Super A, Super B, and Super AA58. For the purpose of this discussion, Super blends containing a predominance of the latter have been excluded due to their unusually low optical activity. It should be noted that such samples are rarely encountered.

† It was assumed that all samples submitted for evaluation were blended and adjusted in the manner normally accepted within the industry.

nually in our laboratories, normally within a 4-month period following the distillation of each crop. The selected lots were chosen solely on the basis of superior odor qualities (with lavender resemblance being the principal criterion), after analytical authenticity had been established.

Gas-liquid chromatography was employed for the chemical analyses. Olfaction, based on an arbitrary scale of 10, was determined in a blind panel and represents the average ratings of three professional perfumers. In addition, each sample was submitted to the panel on at least three different occasions, in order to ensure the validity of subjective evaluation. A summary of the results of the evaluations—chemical, physical, and organoleptic—is presented in Tables III, IV, and V.

TABLE III

PHYSICOCHEMICAL AND ORGANOLEPTIC EVALUATION OF LAVANDIN (1971-1976)

	All Abrialis	Selected Abrialis	All Super	Selected Super
Specific Gravity, 25°C	0.883 to 0.906	0.887 to 0.896	0.885 to 0.895	0.885 to 0.894
Optical Rotation, 25°C	+2.30° to -5.75°	+0.30° to -4.20°	-4.50° to -7.70°	-6.65° to -7.65°
Refractive Index, 20°C	1.4587 to 1.4684	1.4614 to 1.4644	1.4576 to 1.4632	1.4576 to 1.4600
Ester Content	16% to 33%	25% to 30%	31% to 47%	41% to 45%
Olfaction/10	4.3	8.3	5.3	8.2
Number of Samples	130	16	57	14

TABLE IV

PHYSICOCHEMICAL AND ORGANOLEPTIC CORRELATIONS FOR LAVANDIN ABRIALIS (1971-1976)

	Selected Lots	Lots With Camphor > 10%	Lots With Ester Content < 20%
Specific Gravity, 25°C	0.887 to 0.896	0.889 to 0.899	0.895 to 0.906
Optical Rotation, 25°C	+0.30° to -4.20°	+2.30° to -3.80°	+0.35° to -5.75°
Refractive Index, 20°C	1.4614 to 1.4644	1.4587 to 1.4630	1.4587 to 1.4684
Ester Content	25% to 30%	19% to 32%	16% to 19%
Olfaction/10	8.3	1.8	1.0
Number of Samples	16	30	9

TABLE V

PHYSICOCHEMICAL AND ORGANOLEPTIC CORRELATIONS FOR LAVANDIN SUPER (1971-1976)

	Selected Lots	Lots with Ester Content < 40%	Lots with Rotation < -6.65°	Lots with Refraction > 1.4600
Specific Gravity, 25°C	0.885 to 0.894	0.886 to 0.892	0.886 to 0.895	0.886 to 0.895
Optical Rotation, 25°C	-6.65° to -7.65°	-5.00° to -7.70°	-5.00° to -6.30°	-5.15° to -6.30°
Refractive Index, 20°C	1.4576 to 1.4600	1.4580 to 1.4610	1.4589 to 1.4632	1.4604 to 1.4632
Ester Content	41% to 45%	31% to 39%	32% to 44%	33% to 44%
Olfaction/10	8.2	4.8	4.3	4.0
Number of Samples	14	14	15	10

Certainly the physicochemical limits established in our laboratories for those lavandin samples correlating to high olfactory ratings are not absolute, and examination of future crops may necessitate some modifications. Nevertheless, a study of the accompanying tables yields several interesting observations. For example, a reduction in ester content of both the Abrialis and Super types usually presages a poor olfactory rating. We have not been able to show significant correlations between refraction or optical activity and olfaction in the Abrialis type, although an increase in camphor is ordinarily disadvantageous. However, increased refraction is usually accompanied by reduced optical activity in the Super type and is generally indicative of oils of poor olfactory rating.

References

1. Vinot, M., and Bouscary, A., Studies on lavender III: lavandin and optical rotation, Recherches, No. 14, 1964, pp. 57-72.
2. Essential Oil Association of U.S.A., Standard No. 163, Jan. 1960.