

**TRANSFORMATIONS OF MENTHOL,
MENTHONE AND MENTHYL ACETATE IN
M. ARVENSIS L. WITH RELATION TO AGE OF
PLANT**

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ALTHOUGH considerable work has been done on the biosynthetic pathway of constituents of oil of *Mentha piperita*¹⁻⁵ comparatively little has been studied on *Mentha arvensis* for its biochemical changes due to change in environment and dynamics of plant metabolite during growth⁶⁻⁸. The present attempt was, therefore, initiated to understand the variation in concentration of menthol, menthone, menthyl acetate and terpenes at different stages of growth and temperature.

M. arvensis L. was planted in January 1985 at the CIMAP Regional Centre, Pantnagar. Leaves, collected after 43 days of sowing (DAS) to final harvest (123 days) at an interval of 3 days, were distilled in Clavenger's apparatus for oil yield. The oil dried over anhydrous sodium sulphate was analysed by GLC using a gas chromatograph (Perkin Elmer 3920 B) fitted with TCD and 180×0.3 cm stainless steel

column packed with 10% carbowox 20 M on chromosorb WAW. Peak areas and relative percentage were recorded using an integrator (HP 3390 A). The average of three consecutive readings was made (table 1).

The oil content in the leaves tended to increase up to 111 DAS and 68-75% menthol was recorded at 43-51 DAS indicating its presence in the plant at the initial stage of crop growth. However, at this stage the menthone content was highest. Increase in menthol content was noted at every stage of observation up to 99 days of crop age with decrease in menthone and menthyl acetate content. After 99 days there was again decrease in menthol content but the oil content in the plant tended to increase thus indicating that the crop should be harvested after 100 days. Up to this stage increase in menthol content was associated with a decrease in menthone content but after 99 DAS there was decrease in menthol content associated with increase in the menthyl acetate and terpenes in the oil (table 1 and figure 1). This infers that in *M. arvensis*, maximum menthol is accumulated up to 99 DAS and thereafter some parts start converting into menthyl acetate and terpenes. This agrees with earlier studies^{9,10} except that after attaining optimum concentration of menthol in oil some part of it gets converted into acetate and terpene.

Data presented in table 1 indicate the influence of temperature on biosynthesis of menthol. The highest

Table 1 Variation of different constituents of oil of *M. arvensis* with the age of plant and atmospheric temperature

Age of the crop (days)		Oil content fresh wt basis	Menthol (%)	Menthyl acetate (%)	Menthone (%)	Terpenes (%)	Temperature	
							Max.	Min.
43-51	I	0.29	75.2	2.8	15	3.98	27.3	7.16
	II	0.27	68.2	3.4	18.7	5.7	23.5	7.7
55-63	I	0.32	76.0	1.91	12.26	2.96	31.8	11.3
	II	0.29	70.9	3.16	16.1	2.8	28.2	11.4
67-75	I	0.36	78.0	1.98	11.28	2.10	34.0	12.1
	II	0.32	74.73	1.94	13.3	4.7	28.3	14.4
79-87	I	0.39	79.0	1.90	10.8	2.80	35.6	14.1
	II	0.38	77.03	1.48	10.6	5.1	28.3	14.4
91-99	I	0.53	79.9	0.86	10.3	2.33	37.0	14.6
	II	0.49	77.73	1.88	6.4	7.3	36.2	15.7
103-111	I	0.57	72.3	2.18	12.8	4.7	39.0	16.8
	II	0.71	67.52	2.54	10.4	8.02	37.3	18.0
115-123	I	0.57	68.7	5.8	13.5	5.35	40.6	21.6
	II	0.70	69.21	2.78	7.8	8.2	38.6	23.3

1985-I; 1986-II.

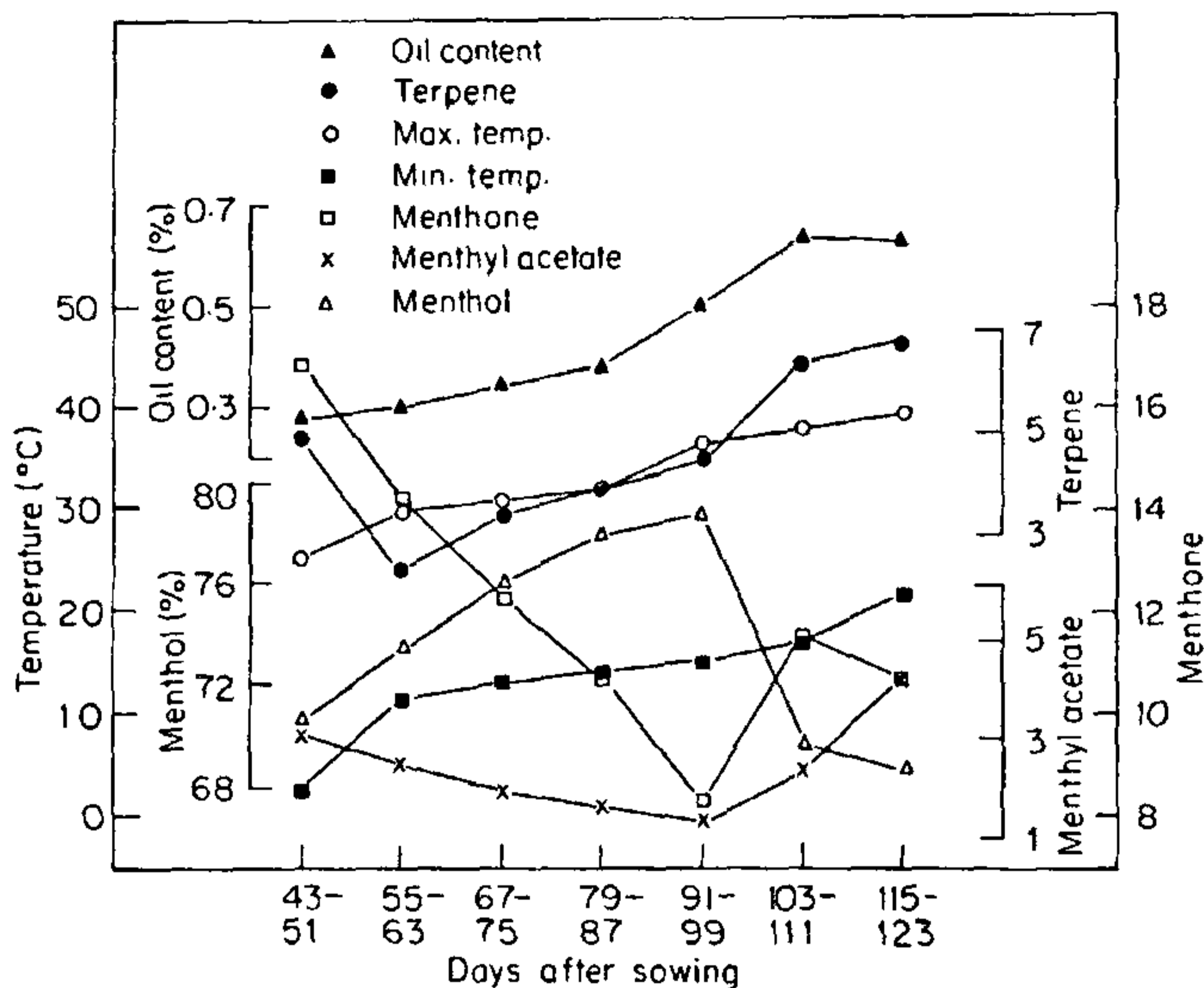
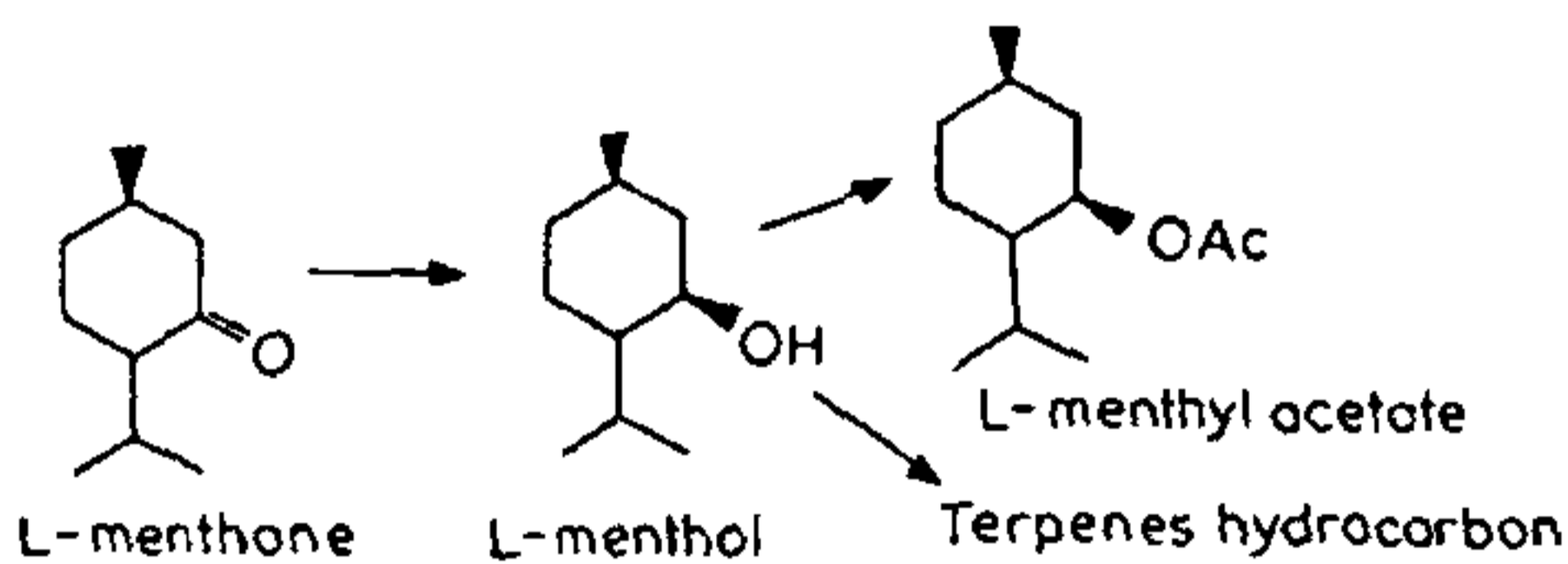


Figure 1. Constituents of *Mentha arvensis* L. oil as influenced by age of plant and temperature, based on two years average.



menthol content was recorded when the maximum and the minimum temperatures were 37°, 14.6° and 36.2°, 15.7°C respectively in 1985 and 1986. The increase in the maximum temperature beyond 37°C and minimum beyond 15.7°C (figure 1) produced better oil yield but was of poor quality (it caused reduction in menthol content with increase in menthyl acetate and terpenes) indicating that for higher menthol content in *M. arvensis* oil maximum and minimum temperatures should range between 36 and 37° and 14 and 15.7° respectively in tarai climate of U.P.

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