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Effects of Planting Time and Quality Characters of Essential Oil in Peppermint

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ABSTRACT

Evaluation for essential oil composition and to assess the change in quality of essential oil with age, harvesting time and maturation phase *M. piperita* clones namely MP-1 to MP12 were taken under study. It was found that nine cultivars with basic chromosome number 2n=72 , were best suited under fluctuating environments with respect to oil content and quality as well with more than 70 % menthol content. Oil yield peaked at 114 kg ha-! on 31 January. At this time the composition of extracted oil was: menthol 43.1, menthone 28,menthyl acetate 6.6, cineole 4.1, and menthofuran 3.8%. After this date oil yield declined steadily because of leaf senescence, while the percentage of menthol, menthyl acetate, and menthofuran increased, and menthone decreased.

Keywords— *Mentha piperita*, Menthol,Acetocarmine, Menthone

I. INTRODUCTION

Mentha piperita L. commonly known as peppermint is a chief genus of family lamiaceae (Labiatae) and is commercially valuable due to its essential oil which is used in cough syrups, toothpastes, pain relieving balms and creams, mouthwashes, shaving crème and chewing gums. The principle constituent in the oil of *Mentha* is Menthol which is reported to be converted from biosynthetic pathway of Pulegone –Menthone – Menthol – Menthyl acetate except for slow conversion rate of menthone to menthol in peppermint (Murray et al., 1972). The oil quality plays a vital role in its market value as it degrades after harvesting, while kept for certain period of time. The paper deals with role of harvesting time along with ploidy status on the oil quality and content as well. Yields of oil in Oregon averaged 65 kglha in the period 1970 -79 (Horner 1980) and early results in New Zealand (Lammerink & Manning 1971, 1973) showed that peppermint oil of similarly high yield (47 - 84 kg ha-!) and of good quality could be produced when the crop was harvested at full-late bloom. However, yields on Canterbury farms (Mrs L. Wiltshire pers. com.) have been much less than those measured in research plots and are related both to poor cultural techniques and incorrect time of harvest. Determination of the correct time of harvesting is extremely important both for maximum yield and for highest quality of oil. A good quality oil requires a content of at least 45% menthol and 15 -18% menthone and isomenthone. Menthol occurs in older leaves, whereas menthone is in small, immature leaves but declines as they mature; optimum quality is therefore a blend of young and old leaves. In Oregon, total oil content increases until plants commence flowering, then it slowly declines, although menthol, menthyl acetate, and neomenthol components continue to increase (Loomis & Croteau 1979). The undesirable component, menthofuran, decreases in leaves at increases rapidly in the flowers, particularly in warm night conditions.

II. MATERIALS AND METHODS

M. piperita clones namely MP-1 to MP12 were grown in RCBD (Randomized complete block design) in plot size 5x3 meters each with basal dressing. Crop harvested twice one after 70 – 90 days and other after 120 days of plantation. And oil distilled in Clevenger apparatus and were tested for its quality content using Perkin-Elmer's GLC apparatus. The essential oil was reported to possess well balanced aroma with 70 – 90 % menthol on an average with green herbage and oil yield. Somatic chromosome numbers were studied from root tips of plants using acetocarmine stain. Photomicrographs were taken from temporary slides using bright field phase contrast attachment of Zeiss Standard 16 research microscope.

The experiment was conducted on a vigorous peppermint stand planted in April 1977 on a Wakanui silt loam previously in high producing pasture. Weeds were controlled by terbacil (1.0 active ingredient (a.i.) ha-1) applied in earlr winter. The stand was fertilised with 50 kg N ha- applied as urea on 20 December, two

weeks before the first harvest. No other fertiliser was applied, because the soil test showed adequate levels. Irrigation using an oscillating sprayline wasapplied at about weekly intervals from 5 January to 12 February and again on 10 March. The aim was to maintain available soil moisture above 500/0, and soil samples were taken before and after each watering to check this. The experiment was a completely random design, with 13 weekly harvests (HI, H2, ... H13) as the treatment, and replicated four times. Plot size was 2 x 2 m. Harvests were conducted from 3 January to 28 March 1979, cutting a 1.0 m2 area in the centre of each plot. The green material was weighed and a 400 g subsample taken for distillation. At the same time 25 stems were cut adjacent to the sample area and stem length, leaf: stem ratio, and total dry matter production were measured.

III. RESULTS AND DISCUSSION

Oil yield is a function of oil content in green herbage as oil content increases when the crop has left for 24 hrs after harvest as the moisture loss results in oil content increase. But the oil quality which is the resultant of various other components get deteriorated as the time passed from morning to evening or vice-versa. Moreover ,the genotype and management conditions such as harvesting time,plant age and crop density also influence the qualitative characters of many aromatic plants (Marroti et al,1994).The occurrence of polyploidy in the genus *Mentha* is common both at intra and interspecific levels(Harley and Brighton,1977;Singh and Sharma,1986). From karyologic point of view *M. piperita* shows a large variation in chromosome number ranging from 2n=36 to 120 with base number x=12, owing to the change in the biosynthetic pathway resulting in the change of essential oil quality. The most common chromosome no. (2n=72)is associated with Menthol content ranging from 60-70 percent (Chemotype MP-1,2,3,4,6,8,10,11,12) while MP-9 AND MP-7 shows basic chromosome number 2n=36 and MP-5 with 2n=48 and Pulegone interaction in the essential oil. Further, Bhardwaj (1989) has reported that menthol content, an important constituent of essential oil was found significantly correlated with oil content as was found obvious from above table. Patra et al. (1988) have concluded that there exists a positive relationship between oil and menthol content. The variation in the amount and quality of oil produced from leaves of different ages on the same plant has been demonstrated in peppermint. The variation was assumed to represent the effect of time on terpene synthesis (Battaile and Loomis, 1961). However, in the above results have been in conformity but the time variation may be attributed either due to maturation of oil glands with age or genetic factors that play role in hindrance of biosynthetic pathway resulted in accumulation of menthol or Pulegone the end product of terpene conversion.

Evaluation for essential oil composition revealed that seventy percent population synthesize terpenoids of maternal types (menthol and menthone). While the rest had those of paternal type (carvone pulegone) and related compounds. In the present study, as reported earlier(Kassahun et al.,2011) the efforts have been made to assess the change in quality of essential oil with age, harvesting time and maturation phase. It has been reported that nine cultivars were best suited under fluctuating environments with respect to oil content and quality as well with more than 70 % menthol contents.

	Somatic Chromosome No. (2n=x=12)	Oil content (%)	Oil Yield (Kg/ha)	Menthol content (%)
Range	2n = 3x, 4x and 6x 36, 48 and 72	0.6 – 1 .0	314 - 400	65 – 80
Mean		P = ≥ 0.01 – 0.05		

IV. CONCLUSION

Eucalyptus, camphor, pine, thyme and peppermint oils should be scratched from cautionary lists. Hyssop and sage oils are only a risk in convulsant oral doses, and lower doses are very likely to be hypotensive. Therefore, they should not be contraindicated in hypertension. It is likely that rosemary oil follows the same pattern. Inhalation data suggest that essential oils presenting a risk include grapefruit, lemon, caraway, black pepper, fennel, tarragon and other oils high in carvone or limonene. However, in the human studies the increases were only slight.

There is no clear evidence that essential oils have adverse effects on the control of BP in humans. Some essential oils may present a risk to some classes of hypertensive patient, in certain dose/route combinations, and there may be a theoretical argument for exercising caution in certain cases of hypertension and hypotension. However, until we know more about where the risks lie, there is no case for contraindication of any essential oils.

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