EFFECT OF PLANTING TIME AND DENSITY ON YIELD AND QUALITY OF PEPPERMINT (MENTHA PIPERITA L.) UNDER SU-TROPICAL CONDITION

P.C Sharma and P.B. Kanjilal
Division of plant sciences & Ecology
Regional research laboratory, Jorhat – 785006 Assam.

Received: 3rd August, 1998
Accepted: 4th February, 1999

Abstract: A field trial was conducted at the research farm of RRL, Jorhat during 1995 and 1996 to study the performance of Mentha Piperita under varying dates of planting and row spacings, maximum herbage and oil yield were obtained from January plants crops. Yield deceased when planting was delayed planting at a closer row spacing of 45 cm recorded the maximum herbage yield of 61'92 q/a while the yield was reduced with wider row spacing of 360 cm or 75cm. However, the quality of oil as measured by the menthol content (71’0 – 72’3% was not affected by planting time as well as spacings.

Key words: Mentha piperita menthol, essential oil, planting time, row spacing

INTRODUCTION:

Peppermint (Mentha piperita L) is an annual herb belonging to the family labiataeae. The chief constituent of the oil is menthol which is used extensively in pharmaceutical, confectionery and flavour industries. At present India contributes about 40% of total world production of this oil. The area occupied in our country is estimated to be 35000-40000 ha with annual production of around 5000 tonnes of oil valued at Rs 125 crores (Singh 1996) cultivation of Menthe Piperita has been taken up in tarai districts of Uttar Pradesh, parts of Punjab and himachal Pradesh but its commercial cultivation has remained restricted to U.P state mainly in tarai district. However, its economic cultivation has not grown to a sizable area in North east region, perhaps due to several factors including the lack of information of the agronomic aspects of this crop. Among the various factors which affect growth time of planting and proper spacing are important. Keeping the above in view studies were undertaken to know the effect of planting time and row spacing on the growth and yield of M. Piperita under jorhat condition.

MATERIAL AND METHODS

The trial was conducted at the research farm of RRL Jorhat. India located at 26’45”N latitude and 94’46”E longitude at 87 m above man sea level during 1995 and 1996. the climate was characterized as sub-tropical with a temperature range of 11 to 28°C. The relative humidity averaged 78 percent and annual precipitation was 1800mm.

The experiment was laid out in randomized block design (RBD) having four dates of planting (January 15, January 30, February 14 and March 1 and four row spacings 30,45,60 75 cm replicated five times. The soil of experimental area was sand loam in
texture with 6.0pH medium in available nitrogen and phosperous and rich in potassium respectively and weeding was done manually as and when required while phosphorus and potash were applied at planting time, nitrogen was applied in two equal splits half at planting time and half after harvesting. Fresh splits with roots were planted in the experimental plots of 3sq.m. size in the rows in shallow furrows. Which were level afterwards and irrigated. The crop was harvested twice, first when it was 120 days of planting (early blooming stage) and second 90 days thereafter. There was no flowering during second harvest. On five random plants data were recorded on plant height and number of branches and 200g random plant samples were used for estimation of leaf stem ratio. The fresh herbage yields were recorded and essential oil content on v/w basis was extracted by hydrodistillation using a Clevenger glass apparatus at each harvest. Qualitative and quantitative analysis for menthol content of essential oil was carried out in a 10% OV-101 (2m*2mm) column at initial temperature 110°C hold for 10 min and then programmed at a rate of 30/min to final temperature of 210°C. The carrier goes (N2) flow was 25ml/min.

RESULTS AND DISCUSSION:

Effect of date of planting: the plant height, number of branches and leaf stem ratio were affected significantly by different planting dates (Table 1) planting on 15th January recorded the maximum plant height (64.43cm) number of branches (34.56) and leaf stem ratio (1.42), which was significantly higher to other planting. The growth of the plant was linear from 15th January to 1s March and the same trend was observed with leaf stem ratio also. The better growth in the earlier planting dates could be attributed to equitable climate throughout the growth period by the early planted crops (Kohari et al. 1996).

The average yield data (table 2) indicated that the crop planted in 1st January recorded maximum herb 61’92 q/ha) over the yield obtained from crop planted on later date. The higher yields might be due to better establishment and to longer period available for vegetative growth of the plants in earlier plants which were more conducive (Muni Ram et al 1997). Relatively lower temperature and optimum relative humidity associated with early planting were suitable for growth and development of early planted crop (Rao et al 1990). Similar results have been reported in Japanese mint by Gulati and Duhan 1971. Planting dates had more effect on the yield obtained from first cuttings i.e flowering stage as compared to second cutting.

The higher herb yield in case of harvesting the crop at flowering stage might be due to the longer growth period producing longer taller plants with more number of branches and more leaf stem ratio. The results are in conformity with the earlier report (Gill ad Randhawa 1992).

The oil content in leaf was maximum during first harvest i.e flowering stage. At this state plants had comparatively more natured leaved with less moisture content, eventually containing higher content of oil than that of the earlier stages of crop growth (Baskar and Putievsky 1978). The oil yield of 1’20 kg/ha was recorded at flowering stage which was significantly higher than those obtained under vegetative stage (30’26 kg/ha).

These results are in the conformity to the findings of farooq and naqui (1983). With the abscission of mature leaves during most flowering stage the oil concentration decreased. However, no marker effect was observed on the quality of the oil ad
measured by the menthol content (71.0–72.3%).

**Effects of Spacing:**

Fresh herbage yield and oil yield was maximum in the case of 45 cm row spacing (Table 2) compared to the wider row spacing of 60 cm and 75 cm and the closest spacing of 30 cm. The treatment 45 cm row spacing recorded on the yield of 61.92 Q/ha with an oil yield of 37.40 kg/ha. The mobility of the plants to cover the space between the rows led to less planting density per unit area and resulted in lower yield in 60 and 75 cm row spacing (Singh and Nand 1979). In case of 30 cm row spacing high density of plants was observed which might have led to competition for space light inefficient utilization of nutrients etc. resulting into less plant growth characters and lower herbage yield. The higher herbage yield under 15 cm row spacing might be due to optimum plant population, proper utilization of moisture and nutrients by the plants which resulted in more leaf growth per plant leading to higher herbage yield. Vadiel et al (1980) and Randhawa et al (1984) have also reported similar results.

**ACKNOWLEDGEMENT**

Authors are grateful to Director, RRL Jorhat for providing facilities and encouragement. We are also thankful to Dr. R.S Singh, Head, Plant science & Ecology Divn for encouragement and to shri.A.K Baruah of Alanalytical divn. For GLC interpretation of oil.

**Table -1**

Plant height, number of branches and leaf stem ratio of peppermint as influenced by data of Planting and row spacing (pooled over two years)

| Treatments          | Plant height (cm) | Number of branching/plant | Leaf stem ratio |
|---------------------|-------------------|----------------------------|-----------------|
|                     | C1                | C2                         | C1              |
| Date of planting    |                   |                            |                 |
| January 15          | 62'43             | 53'18                      | 34'56           |
| January 30          | 59'31             | 46'20                      | 31'31           |
| February 14         | 54'24             | 40'56                      | 26'08           |
| March 1             | 48'06             | 36'62                      | 22'40           |
| C.D at 5%           | 3'16              | 4'05                       | 2'43            |
| Row spacing         |                   |                            |                 |
| 30cm                | 64'46             | 51'63                      | 31'46           |
| 45cm                | 68'32             | 56'08                      | 35'29           |
| 60cm                | 56'28             | 47'70                      | 26'91           |
| 75cm                | 53'84             | 42'26                      | 23'57           |
| C.D at 5%           | 3'18              | 3'21                       | 2'27            |

C1 = First cutting   C2 = Second cutting
Table -2
Herb yield, oil content and menthol content of peppermint as influenced by data of Planting and row spacing (pooled over two years)

| Date of planting | Herb yield (g/ha) | Oil content (%) | Oil Yield (kg/ha) | Menthol content (%) |
|------------------|-------------------|-----------------|-------------------|---------------------|
|                  | C1                | C2              | C1                | C2                  | C1 | C2 |
| January 15       | 68’32             | 54’24           | 0’603             | 0’558               | 41’20 | 30’26 | 71’2 | 71’3 |
| January 30       | 59’70             | 46’52           | 0’600             | 0’563               | 35’82 | 26’19 | 72’0 | 71’0 |
| February 14      | 46’28             | 38’29           | 0’605             | 0’560               | 28’00 | 21’44 | 72’3 | 71’5 |
| March 1          | 41’82             | 35’18           | 0’603             | 0’556               | 25’22 | 19’56 | 71’0 | 72’3 |
| C.D at 5%        | 4’10              | 3’29            | -                 | -                   | 2’29 | 2’10 | - | - |
| Row spacing      |                   |                 |                   |                     |
| 30cm             | 56’24             | 47’43           | 0’600             | 0’563               | 33’74 | 26’70 | 71’0 | 71’5 |
| 45cm             | 61’92             | 54’61           | 0’604             | 0’560               | 37’40 | 30’5  | 72’3 | 72’3 |
| 60cm             | 52’38             | 41’41           | 0’600             | 0’558               | 31’43 | 22’96 | 72’0 | 71’5 |
| 75cm             | 46’27             | 38’53           | 0’602             | 0’558               | 27’85 | 21’50 | 71’2 | 72’0 |
| C.D at 5%        | 2’00              | 2’90            | -                 | -                   | 2’02 | 1’90 | - | - |

C1 = First cutting C2 = Second cutting

REFERENCES:

Baskar, D. and Putivsky E. 1978: Seasonal variation in the yields of herb and essential oil in some labiatae species. J. of Horticultural science. 52(3): 179-183.

Farooq. A., Mishra A., and Naqvi A.A. 1983: Effect of plat age on quality of oil in Japanese mint. Mint. Indian perfumer, 27 (2), 80-82

Gill. B.S. and Randhawa G.S. 1992 Effect of transplanting dates and stage of harvesting on the herb and oil yields of French basil (Ocimum basilicum L) Indian perfumer 36(2), 102 – 110

Gulati, B.C and Duhan S.P.S 1971: Japanese mint in nainital aria of Uttar Pradesh. Indian perfumer (15 (1): 1-14

Kothari, S.K Singh, V.P and singh U.B. 1996: The effect of row spacing and nitrogen fertilization on the growth and oil yield composition of Japanese mint J Med Aro Plant science 18(1): 17-21

Muni Ram, Gupta M.M., Naqvi A.A. and Kumar S. 1997: Effect of planting time on the yield of essential oil and artemisinin in Artemisia annual under subtropical conditions. J. Essent oil res 9(2): 193-197
Randhawa G.S, Mahey R.K., Sidhu B.S and saini S.S 1984: Herb and oil yields of menthe spicata under different row spacions and nitrogen levels in Punjab. Indian perfumer 28(384), 146-148.

Rao, L.J.Sreenivas B. Reddy M.G 1990: Effect of planting dates and intra –row spacing on growth, herbage and oil yield of Davana (Artemisia Pallens Wall). Indian Perfumer, 34(4), 250-252.

Singh A. 1996 Cultivation of mint and potential for increasing the production Pafai. J 18(3), 23-28

Singh N.P and N and K 1979 Response of menthe citrate Ehrh to dates of plantings and row spacings Indian perfumer 23 (1), 50-52

Vadiel B.A Arumugham R and Kumar. N 1980: Influence of row spacing on the yield and oil content of bergamot mint (Mentha citrate Ehrh) Indian perfumer 24 (1); 207-209.