Indian J. Genet., **64**(3): 253-254 (2004)

Short Communication

Evaluation of different genotypes of *Mentha* species for resistance potential to sweetpotato whitefly (*Bemisia tabaci*)

Dwijendra Singh[1], D. K. Singh[1], J. R. Bahl[2] and R. K. Tiwari[2]

[1]Entomology Division, [2]Genetics and Plant Breeding Division, CIMAP, Lucknow 226 015

(Received: September 2003; Revised: November 2004; Accepted: November 2004)

Mentha species suitable for commercial cultivation both in tropical and temperate regions of the world are the major source of natural menthol, carvone and linalool, which are used in the cosmetic, perfumery, beverage, soft drink and pharmaceutical industries. The mint crops attacked by a number of arthropods including whiteflies that has also developed resistance to insecticides [1-4].

Twenty six entries of *Mentha arvensis*, 13 of *M. piperita*, seven of *M. cardiaca*, one of *M. citrata* and three of *M. spicata* were evaluated in 1999 and during the year 2000, 19 mixed entries of mint species those assumed resistant for their resistance potential to sweetpotato whitefly [*Bemisia tabaci* (Gennadius) *Homoptera: Aleyrodidae*. Most of the entries from India were from the Districts of Lucknow, Barabanki (26.5°N 81°E) and Pantnagar (29° N 80°E). Each entry of *Mentha* species were grown replicated thrice in Randomized Block Design by planting healthy stolons in January, 1999 and 2000 in the rows 60cm apart in plot size 5.90 × 4m followed by irrigation. The crop was fertilized with 120 kg N, 60 kg K and 60 kg P per hectare, and irrigated six times and none of the chemical/botanical insecticides were applied during growth and development of the crop.

Adult whiteflies were sampled for estimates of the natural adult population increase on three sampling dates each year (April 26, May 03 and May 13, 1999 and May 26, 29 and June 01, 2000) and their numbers were recorded by using the Yellow Sticky Trap (YST) method with some modifications [5]. The YST for whitefly sampling was fabricated by the use of unbreakable yellow color polyvinyl sheet pieces (60 × 15cm) glued one side with adhesive, and placed between two rows of *Mentha* grown 60 cm apart to count the number of *B. tabaci* adults. Observations on numbers of adults population of whiteflies in mint were taken by YST placed between rows for three hours (6.00 am to 9.00 am) on each sampling date.

The data on number of adults recorded on YST were subjected to statistical analysis. The check entry was the one having the lowest number of whiteflies/YST using the LSD in each experiment, all other entries were then compared to the check entry [6].

The observations presented in Table 1 on numbers of sweetpotato whitefly adults during 1999 showed that among 26 *M. arvensis* entries, MA-92-194 (29.33 YST) and *Kosi* (33.33) were found significantly superior in resistant to whitefly adults as compared to other entries. Among 13 entries of *M. piperita*, MPS-1 (39.67/YST) showed significantly higher resistant potential to sweetpotao whitefly. However, out of seven entries of *M. cardiaca*, on an average MCAS-2 (45.16/YST) and MCAM-19 (49/YST) were found highly significant in resistance to whitefly over other entries sampled. Among *M. citrata* and *M. spicata* entries, *Kiran* of *M. citrata* (68.50 YST), and *Arka* (81/YST), *Neerkalka* (93/YST), and MSS-5 (203.66) of *M. spicata* were observed highly significant in resisting the population of whitefly attack. In year 2000, among 19 promising entries of *Mentha* cultivars and germplasm lines on average MA-B-1 (0.67/YST) of *M. arvensis*, and MSS-5 (3/YST) of *M. spicata* were found possessing significantly high resistance potential to *B. tabaci*.

We observed an outbreak of *B. tabaci* adults in 1991 in the commercial fields of newly developed cultivars of menthol mint (*M. arvensis*) in farmers field in the District of Barabanki and Lucknow. Outbreaks of *B. tabaci* are now usually found regularly in the mint crop possibly because of introduction of new varieties with different chemo-types and possibly by their changed phenological characters, with high population densities in May when the temperature and humidity are usually high in northern parts of India. Several spray applications of insecticides could not control the whitefly population significantly (unpublished data) at the Research Farm of CIMAP, Lucknow. The identification of new cultivars and germplasm lines in different species of mint for their resistance potential to whitefly may enhance the possibility of developing new whitefly resistant varieties of mints in the future.

Table 1. Mean# population of sweetpotato whitefly (*Bemisia tabaci*) per yellow sticky trap (YST) in cultivars and germplasm lines of *Mentha* species during 1999

M. arvensis		*M. piperita*		M. cardiaca		*M. citrata & spicata*	
Entry	No. of adult whitefly	Entry	No. of adult whitefly	Entry	No. of adult whitefly	Entry	No. of adult whitefly
MA-35	209.33(2.32)	MP-B-2	303.67(2.48)	MCAM-25	127.33(2.10)	Kiran	68.50**(1.83)
MA-92-216	176.66(2.24)	MPM-90-93	284.33(2.45)	MCAM-20	86(1.93)	Neer-Kalka	93**(1.96)
MA-5F	191.66(2.28)	Kukrail	303(2.48)	MCAM-16	112.67(2.05)	MSS-5	203.66**(2.30)
MAH-3	184(2.26)	MPM-44	257(2.40)	MCAM-8	122.33(2.08)	Arka	81**(1.90)
Himalaya	134.66(2.12)	MP-B-1	190.33(2.27)	MCAM-22	136.67(2.13)	-	-
MA-31	138.16(2.14)	MP-98/142	148.66(2.17)	MCAS-2	45.16**(1.65)	-	-
MA-92-101	89.33(1.95)	MP-2	203.67(2.30)	MCAM-19	49**(1.69)	-	-
Kosi	33.33**(1.52)	MP-1	164.67(2.21)	-	-	-	-
MA-92-265	62.50(1.79)	MPM-90-88	300.50(2.47)	-	-	-	-
Shivalik	71.66(1.85)	MP-B-3	249.50(2.39)	-	-	-	-
MAS-1	171.66(2.23)	MPS-3	90(1.95)	-	-	-	-
Kalka	49.16(1.69)	MPS-1	39.67**(1.59)	-	-	-	-
Gomti	71.50(1.85)	MPM-90-89	321.33(2.50)	-	-	-	-
MA-3F	74.00(1.87)	-	-	-	-	-	-
MA-92-194	29.33**(1.46)	-	-	-	-	-	-
MA-92-38	57.00(1.75)	-	-	-	-	-	-
MA-11F	80.67(1.90)	-	-	-	-	-	-
MA-3	151.33(2.17)	-	-	-	-	-	-
MA-92-239	68.67(1.83)	-	-	-	-	-	-
MA-91-3	111.00(2.04)	-	-	-	-	-	-
MA-B-1	190.33(2.27)	-	-	-	-	-	-
MA-1	133.67(2.12)	-	-	-	-	-	-
MA-5	55(1.74)	-	-	-	-	-	-
MA-6	95.67(1.98)	-	-	-	-	-	-
MA-91-2	165.33(2.21)	-	-	-	-	-	-
MAS-92-74	68.67(1.83)	-	-	-	-	-	-
S. E.	0.047		0.07		0.075		0.10
LSD 1%	0.13		0.21		0.27		0.58
LSD 5%	0.09		0.15		0.18		0.31

#Mean of three replicates; Log values of the number of whiteflies are shown in parentheses; **Significant Value; - Blocks not associated with entry in other *Mentha* species.

The lower/higher percentage of the major chemical constituent of cultivars and germplasm lines of *Mentha arvensis* do not correlate well with the number of adult insects. A single major chemical constituent possibly may not be responsible for the whitefly resistance, but it may be caused by a combination of chemical and/ or morphological characters including the color as yet unidentified in mint species. The development of resistant varieties to insect pests is an important component of integrated pest management for commercial crops because of a decreasing risk of developing insecticide resistance in target insects and increased safety to beneficial insects. The genetic improvement breeding programs and possibly using them as markers-for developing new whitefly resistant mint varieties for integrated pest management may be one of the important useful tools as suggested earlier in other crops [7].

The authors are thankful to Dr. G. W. Watson of the IIE, (CAB), London for his help in identification of the whitefly species (supplied by DS), to Mr. Vikram Singh for his generous help in maintaining the cultivars and germplasm lines of mint species during experimental period in the field conditions and to Dr. F. Douglas Wilson of the Western Cotton Research Laboratory, USDA-ARS, USA for his valuable constructive comments and suggestions for improving the manuscript.

References

1. **Singh D.** 1995. Development of suitable sampling methods for the arthropods of four mint species. Insect Sci. Applic., **16**: 333-337.
2. **Singh D.** 1999. Major insect pests of important medicinal and aromatic plants in northern India. Insect Environment, **5**:139-140.
3. **Ballee D. L., Gould G. E. and Fahey J. E.** 1970. Residues of DDT and its analogues in Midwestern mint hay and oil. J. Econ. Entomol., **63**: 1658-1660.
4. **Prabhaker N., Toscano N. C., Perring T. M., Nuessley G., Kido K. and Youngman R. R.** 1992. Resistance monitoring of the sweetpotato whitefly (*Homoptera: Aleyrodidae*) in the Imperial Valley of California. J. Econ. Entomol., **85**:1063-1068.
5. **Gerling D., and Horowitz A. R.** 1984. Yellow traps for evaluating the population levels and dispersion patterns of *Bemisia tabaci* (Gennadius) (*Homoptera: Aleyrodidae*). Ann. Entomol. Soc. Am., **77**: 753-759.
6. **Singh R. K. and Chaudhary B. D.** 1979. Biometrical methods in quantitative genetics analysis. Kalyani Publishers, Ludhiana, India.
7. **Maxwell F. G. and Jennings P. R.** 1980. Breeding plants resistant to insects. Wiley, New York.