

INTRODUCTION



Fig. 1.a. Signs of American foulbrood in field

American foulbrood is a serious bacterial disease that affects *Apis mellifera* colonies; the causative agent is *Paenibacillus larvae* [1].

THE AIM OF THE STUDY was to evaluate the *in vitro* antimicrobial activity of 32 essential oils against *P. larvae*.



Fig. 1.b. Field test for American foulbrood

MATERIALS AND METHODS

Chromatographic analysis

Oils from 21 botanical species were analyzed by gas chromatography (CG and CG/EM). All essential oils were classified according to the composition of their main components in two groups: benzene ring compounds (BRC) and terpene compounds (TC).

Antimicrobial activity

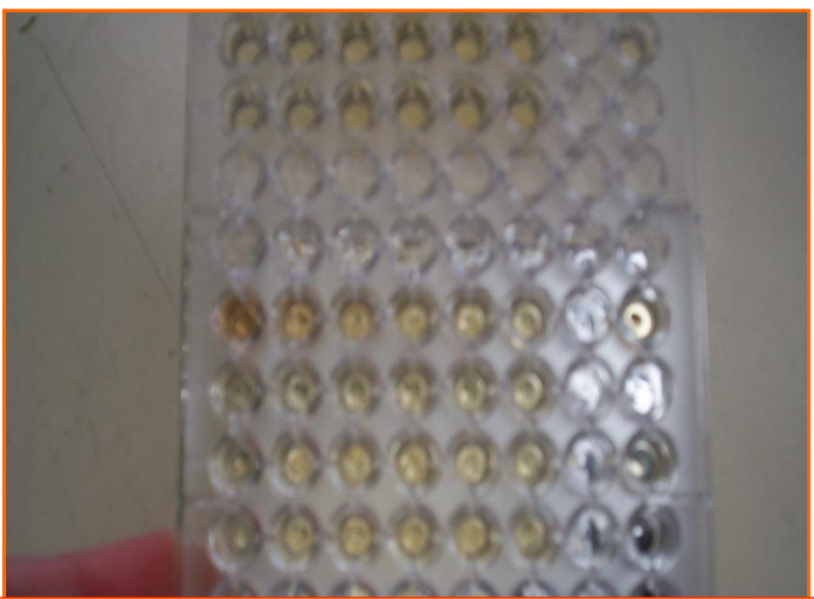


Fig. 3. 96-microwell plates, each cuvette containing a different concentration of the essential oil.

Minimal inhibitory concentration (MIC) in MYT broth [2] was assessed by the microdilution method. Final serial dilution concentrations of the essential oils ranged between 2,000-12.5 µg/mL. The bacterial isolates were collected from different Argentina's region.

The data obtained from the CIM were statistically analyzed using multivariate analysis by means BioEstat 5.0 program.

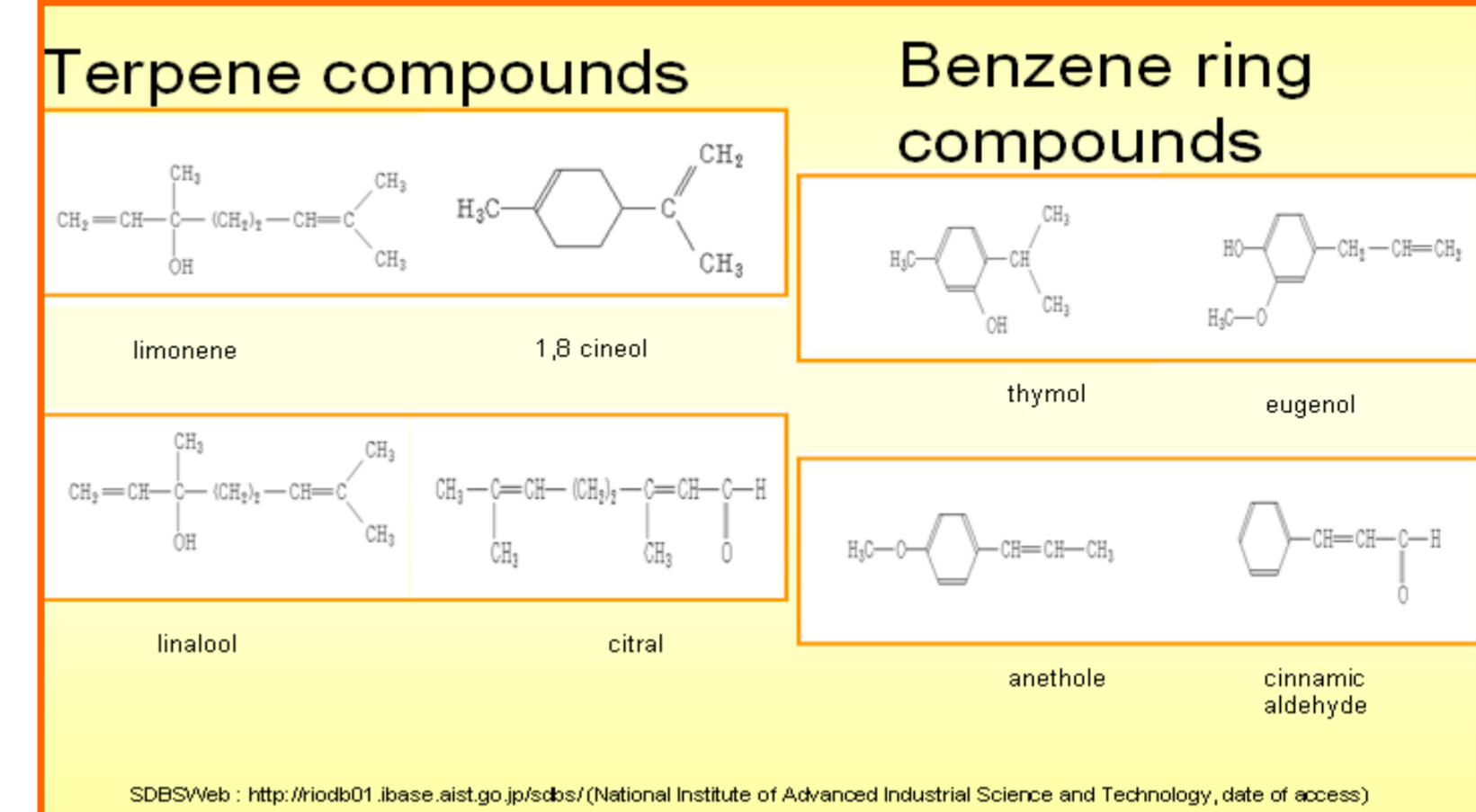


Fig. 2. Examples of terpene compounds and benzene ring compounds

RESULTS

Chromatographic analysis

The chromatographic analysis showed that a 67% of the essential oils contained predominately terpene compounds, while the remaining 33% included mainly compounds with benzene rings.

Antimicrobial activity

Antimicrobial agent	PJ Cb	PJ SdP	PJ LP	PJ V	PJ Tp	PJ Cy	PJ W	PJ MdP
OTC...	CIM 3,125-5	2,5-3,125	0,5-0,625	2,5-3,125	5-6,25	0,1	5	6,25

Lower CIM

Antimicrobial agent	PJ Cb	PJ SdP	PJ LP	PJ V	PJ Tp	PJ Cy	PJ W	PJ MdP
Anis	CIM 300	300	300	300	300	300	300	300
EB	600	600	600-700	600	600	500-600	600	600
Canela 1	CIM 50-100	25-50	50	25	50	50	25-50	50
EB	150-200	100-150	150	150	150-200	150	150-200	150
Canela 2	CIM 350	300-350	300	350	300	300	350	300-350
EB	700	600-700	600	700	600-700	700	600-700	600-700
Canela 3	CIM 200	250	300	300	350	300-350	200-250	200-250
EB	450	500	500-600	600	600-700	600-700	400-600	400-600
Clavo 1	CIM 250-300	250-300	200-300	250	300	200-250	250-300	300
EB	600	700	600	600	600	500-600	600	700
Clavo 2	CIM 300	300	300	300	350	300-350	300	350
EB	600	600	600	600	600-700	600-700	600	700
Hinojo	CIM 250	250	250	250	250	250	250	250
EB	500	500	450-500	500	500	500-600	600	600
Orégano	CIM 400	400	400	350-400	400	350	400	400
EB	700	700-800	800	800	700	700-800	800	800
Tomillo 1	CIM 150	150-200	150	200	200	150	150-200	200
EB	350	350-400	350	400	350-400	300	400	400
Tomillo S...	CIM 50-100	50-100	<50	50-100	<50	<50	50	50-100
EB	250	200	100	200	100	100	100-150	100-200
Tomillo 2	CIM 300	300	300-350	350	300	300	350	300-350
EB	800	800-900	800-1000	900	800-1000	800	900	900-1000
Tomillo C	CIM 300	200-300	300	300	200	200	300	300
EB	1000	800-1000	1000	800	600	800	900	900-1000
Tomillo 3	CIM 200-300	200	300	200	150-200	250-300	200	200-300
EB	600	400-500	600	450	300	600	400-450	600

Higher CIM

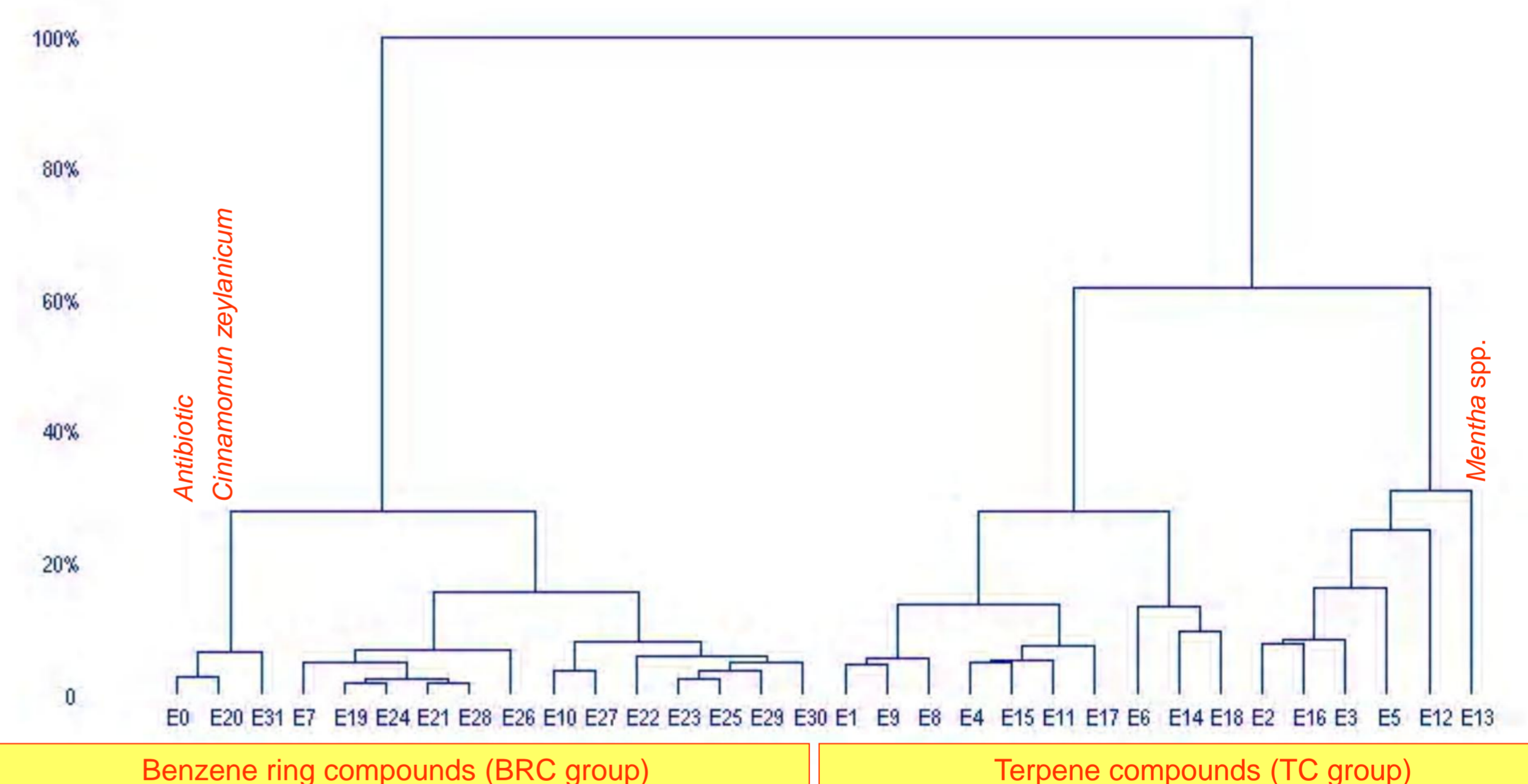


Fig. 4. Dendrogram grouping of essential oils in relation to their antimicrobial activity against 16 isolates of *P. larvae* analyzed.

From the TC group, *Cymbopogon citratus* essential oil showed the best antimicrobial activity against *P. larvae* with MIC values between 150 and 250 µg/ml. The essential oils from *Aloysia polystachya* and *Mentha* spp. had the lowest inhibitory activity. Among the oils from the BRC group, one of the lowest MIC values was found with cinnamon essential oil (*Cinnamomum zeylanicum*) being between 25 and 50 µg/ml; *Origanum vulgare* showed the highest MIC values (350-400 µg/ml).

CONCLUSION

Essential oils, especially those with BRC in their composition, presented inhibitory capacity against *P. larvae* strains.

The present experience, in which essential oils were tested *in vitro* against *P. larvae*, promotes their use for American foulbrood management in honey bee colonies.

REFERENCES

ACKNOWLEDGMENTS

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- LB Gende, MJ Eguaras, R Fritz (2008) Rev Argent Microbiol. 40:147-150.

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