Effect of a growth enhancer Carbon Kick Booster® on mites and natural mite enemies in apple

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Introduction

In the past, the fruit tree red spider mite (RSM) *Panonychus ulmi* was a serious problem in professional apple orchards in Finland. Since the 1990's when IPM was adopted, natural control of RSM has prevailed in many orchards, due to the emergence of resistant naturally occurring predatory mites. In the 2000's, the rejection of OP-insecticides may threaten the success of natural mite control if insecticides which are more harmful to beneficial organisms. The expected warming of climate may lead to better overwintering and even development of one extra generation of RSM. Introduction of new apple cultivars which are more susceptible to the apple rust mite (ARM) *Aculus schlechtendali* has recently increased the importance of this eriophyid mite.

Limited number of specific acaricides are available for growers and repeated sprayings involve a risk of the development of resistance in RSM and ARM populations. As an alternative approach, several plant oil based biorational pesticides have been tested and used especially in organic farming, e.g. in greenhouses. The growth enhancer Carbon Kick Booster® (CKB)[1] containing turnip rape seed oil, emulsifiers and triacontanol was tested in the laboratory and open field to evaluate its effect on pest mites and on the natural mite community in apple trees.

[1][Carbon Kick Ltd, www.carbonkick.fi]

Materials and Methods

In the laboratory tests Carbon Kick Booster® was sprayed as 1.0% and 2.0% solution, with and without Silwet Gold (SG) silicone surfactant (0.025 and 0.05%). Tests were performed by spraying pieces of apple leaves in Potter tower using the amounts similar to 300 and 600 l/ha field sprayings. Assessment of the effect on ARM was made 1, 3 and 6 days after treatment.

Field tests were done at MTT Piikkiö (60º23'N;22º33'E) by spraying trees with a knapsack mist sprayer with 2.0% + 0.05% SG. In 2008, 2.0% sulphur solution (Kumulus) was included for comparison. Pyrethrum was sprayed once (10.7.) to control aphids. Leaf samples were checked before and after sprayings and ARM, RSM and other mites and insects were counted.

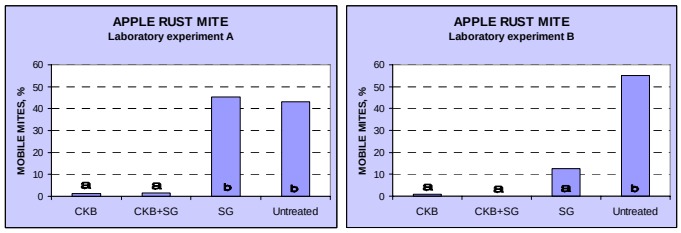

Figure 1. A, B. Laboratory experiments.
Amount of liquids: A: similar to 300 l/ha, B: similar to 600 l/ha. CKB 2.0%, SG 0.05%. Assessment 1 day after treatments. Different letters indicate significant differences within mite groups (ANOVA, Tukey).

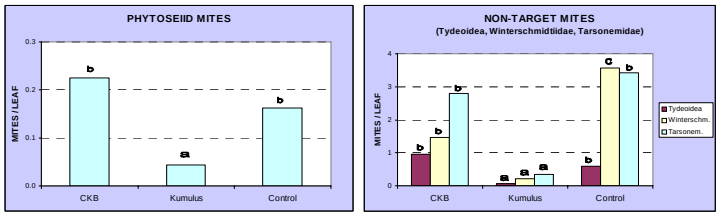

Figure 3. A, B. Field test 2008.
CKB 2.0% + SG 0.05%, Kumulus 2.0%. Effect on phytoseiid mites (A) and other mite groups (B). Results of the samples in August. Different letters indicate significant differences within mite groups (ANOVA, Tukey).

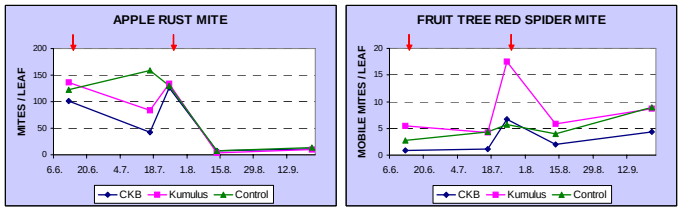

Figure 2. A, B. Field test 2008.
CKB 2.0% + SG 0.05%, Kumulus 2.0%. Sprayings 10th June and 29th July (red arrows).

Results and Discussion

In the laboratory CKB+SG and CKB had a good effect on ARM, whereas the effect of SG alone was poor when sprayed at lower amount of liquid (Fig. 1). In the field test in 2007 the effect of 2.0% CKB+0.05% SG was variable between cultivars and the mean effect of one spray on ARM was 69% and on RSM 89% (Henderson-Tilton). In 2008, the effect of two sprayings of CKB+SG and sulphur was moderate on ARM although there was again variation between cultivars. The initial RSM population was low and the effect of sprayings was not significant (Fig. 2). CKB+SG did not affect significantly on non-target mites except Winterschmidtiidae whereas sulphur decreased the number of predatory phytoseiid mite population as well as other mites (Fig. 3). Besides phytoseiid mites predaceous gall midge larvae (Cecidomyidae) occurred in trees and it was obvious that these predators diminished the number of ARM and RSM.

Biorational pesticides are alternatives for conventional or novel synthetic acaricides although their effect cannot be guaranteed in all circumstances. Weather conditions may have a great influence on the effect of CKB, and repeated treatments may be necessary. Variation of the leaf hairiness of cultivars influence on spreading of the spraying solution onto the leaf surface where ARM live. CKB sprayings did not cause any unwanted effects on plants and it was safe to several beneficial arthropods present in the apple trees, which is an advantage compared to sulphur sprayings.

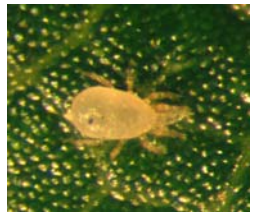

Figure 4. *Anthoseius* sp. (Phytoseiidae).

Figure 5. A gall midge larva (Cecidomyidae).