



Hybrid method of introduction of predatory mites and compatible chemicals in greenhouse strawberries in Japan

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Trigger points in IPM : brief history

- ▶ Early 1980 ; German complaints to Dutch Greenhouse vegetables promoted BC uses in Holland (too much uses of chemicals.)
- ▶ Late 1980s ; Plictran (**Cyhexatin**) miticide ban in California goes to across-the-board uses of predatory mites in strawberry field
- ▶ Mid 2000s ; Spanish Illegal **Isofenphos** MRL of Paprika detection in Germany

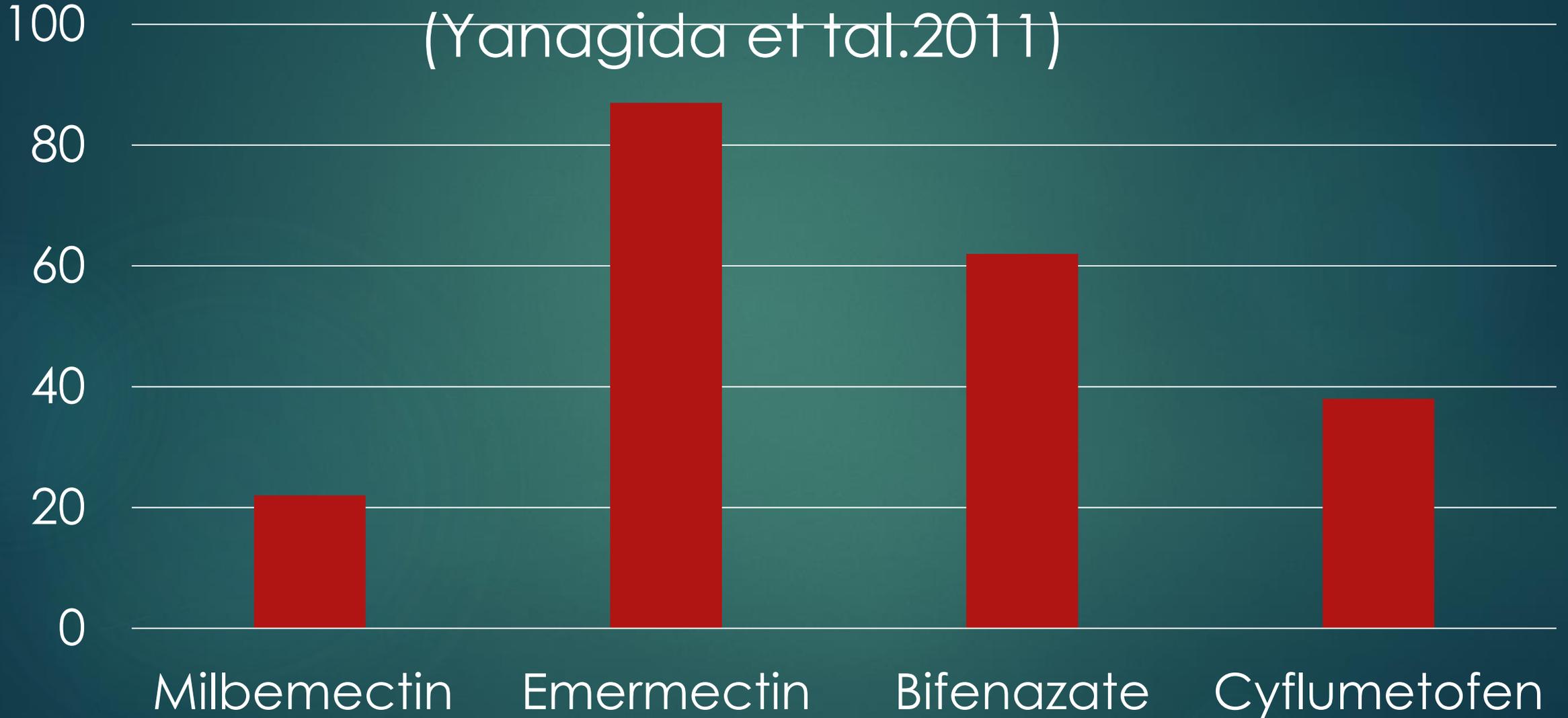
Japan: Excessive uses of Miticides
in Strawberry led to Resistant mites
prevalence

11 times spray 2times
with help of predatory mites.



The fact is

Average Mortality % of *Tetranychus urticae* from 7 Strawberry field in Kyushu
(Yanagida et al.2011)



Reduction of chemical sprays: 11 to 2 treatment a year

The Japanese growers have chosen a “safe and reliable IPM”, where predatory mite introduction and a few application of miticides are rationally combined.

By adopting this strategy, the number of miticide treatments drastically reduced from 11 to 2 times during growing period of 6-7 months (Sept.-March)

Population control at starting time of Biocontrol

Since it is warmer in Japan than in the Netherlands and UK, it is extremely difficult to detect **zero level or low level** population of pests in greenhouses when plants are transplanted in greenhouses from **warm September to October**.

This is because the greenhouses are basically semi-opened and pests can freely enter into the greenhouses in the warmer countries.

Clearance of greenhouse free from spider mites by miticides still workable

So it is not rational to recommend growers early releases of natural enemies when the pest density level is still high.

By pre-application of the less adverse miticides with their designated residual interval before introduction of *Phytoseiulus persimilis* into the pest free or extremely low pest level greenhouses, continual reduction of *Tetranychus urticae* is successfully achieved.

(recently with more *N.californicus*)

3 options for mite clearance

- ▶ 3 weeks before introduction: **pyflubumide** (15%F) + **fenpyroximate** (5%F) mixture combination (Nihon Nohyaku invention)
- ▶ 2 week before introduction: **emermectin** (1%EC) (Syngenta)
- ▶ 1 week before introduction: **milbemectin** (1%EC) (Mitsui Chem. invention)

Additional 6,000 *P.persimilis* and 5,000 *N.californicus* /1,000 m² in **November**.

- ▶ Moreover 6,000 *P.persimilis* are introduced additionally in February when necessary.
- ▶ Availability of compatible miticides was very limited by 1995. Nowadays, a considerable number of miticides with less adverse effect have been developed mainly by the Japanese companies which overturned the old concept of non chemical interruption method.

New and less resistant miticides approved.

- ▶ Miticides which can be used after the predatory mite introduction are;
- ▶ bifenazate 20%, (Arysta)
- ▶ cyenopyrafen 30%, (Nissan Chem)
- ▶ cyflumetofen 20%. (OAT)
- ▶ These miticides are used only when the above pre-introduction method results in failure.

Aphids with flonicamid or *Aphidius colemani*

- ▶ Against other hemipteran and lepidopteran insect pests,
- ▶ flonicamid 50% for aphids, (Ishihara)
- ▶ cyantraniliprole 10% (harmful to honeybee for a few days) for thrips control are recommended as less adverse products compared with conventional insecticides. (Corteva)

Compatible fungicides are still available.

- ▶ For disease control, *Bacillus subtilis* and *Talaromyces flavus* (Idemitsu) are recommended for resistant management even though still many chemical fungicides such as flutianil 5% (OAT), mepanipirim 40% (Kumiai) are commonly used.

Non chemical production is idealistic, but better than no use of BC

- ▶ Only **2%** of Tomato greenhouses are using parasitic wasp of *Encarsia* and *Eretmocerus* due to fear of TYLCV infection and less local governmental supports from extensions, pref.research stations. Still heavy chemical treatment has been going on excessively...
- ▶ Main reason is less planting of TYLCV cultivar tomato but it is not the only reason.

Questions or corrections?

- ▶ Thanks for your interests to my presentation.
- ▶ Tetsuo Tommy Wada