



PESTICIDE RESIDUE COMPLIANCE AND SETTING OF PRE HARVEST INTERVALS IN THE FRESH PRODUCE EXPORT PROCESS

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Supervised trials.

- **Two fold purposes:**
 - A) .-Assisting in MRL settings:**
 - B) .-Determining pre-harvest intervals in specific pesticide/crop combinations to set withholding periods to meet specific maximum residue limits.**

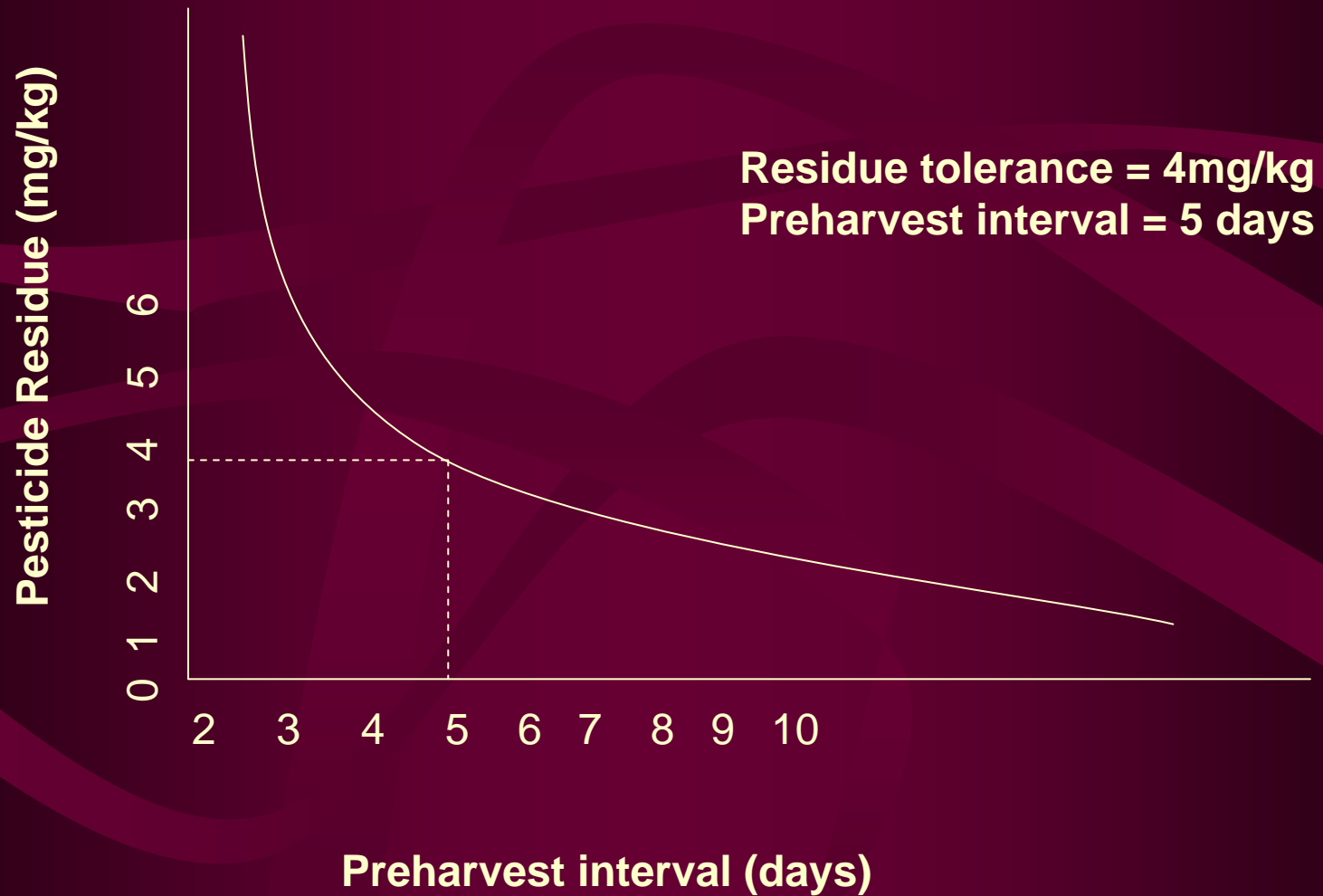
Supervised trials should be conducted in the country concerned, according to local agricultural conditions and national GAPs.

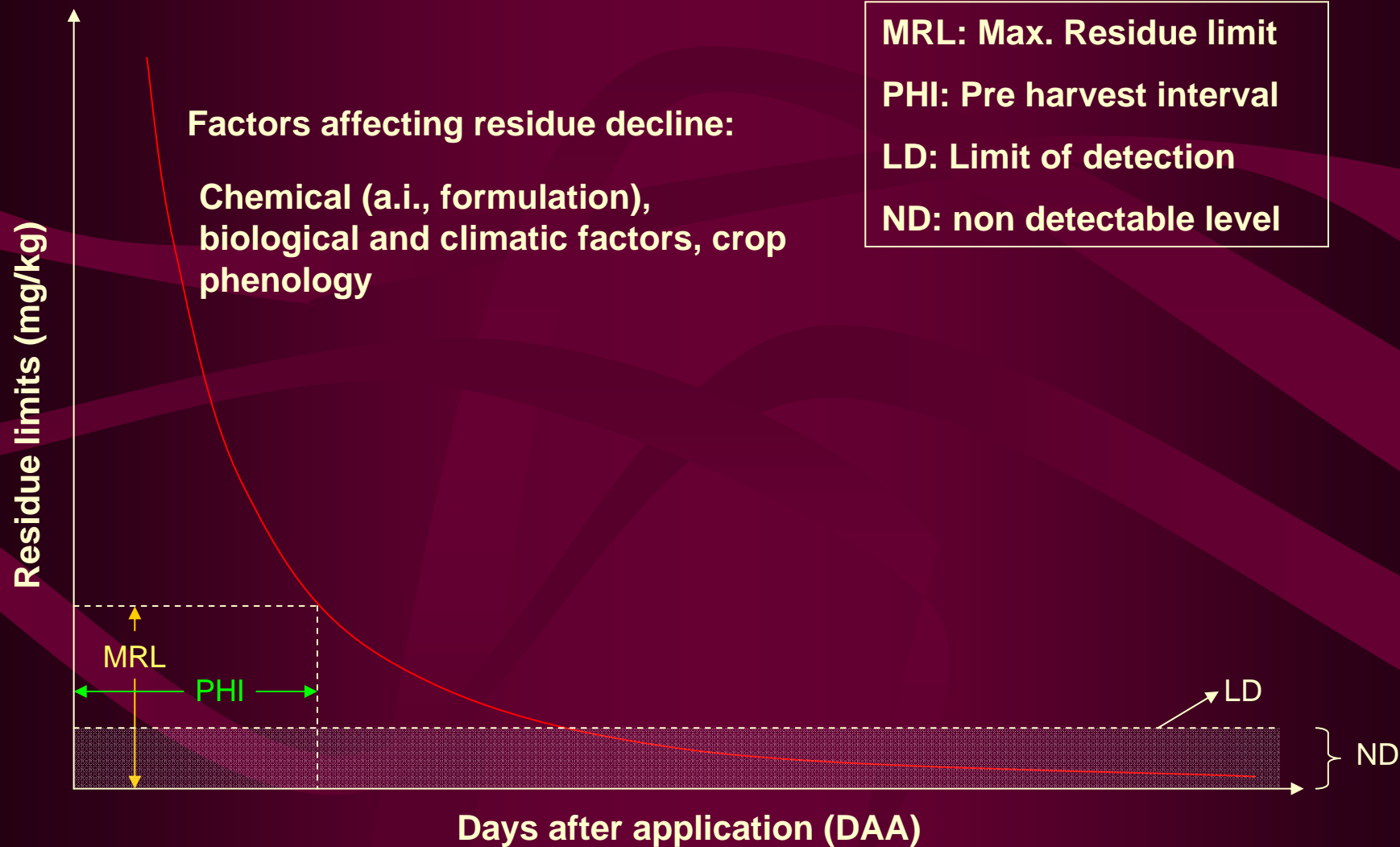
Extrapolation of residue data could be considered in selected minor crops.

Variability of residue levels (concentration) on/in different food items of the same crop is an inevitable condition due to

- a great variety of factors affecting the deposition of pesticides during application on a crop or soil surface and
- the different rates of dissipation processes affecting residues levels in/on the different parts of a plant or plants of the same field.

DISSIPATION CURVE





Factors affecting residue decline:

**Chemical (a.i., formulation),
biological and climatic factors, crop
phenology**

MRL: Max. Residue limit

PHI: Pre harvest interval

LD: Limit of detection

ND: non detectable level

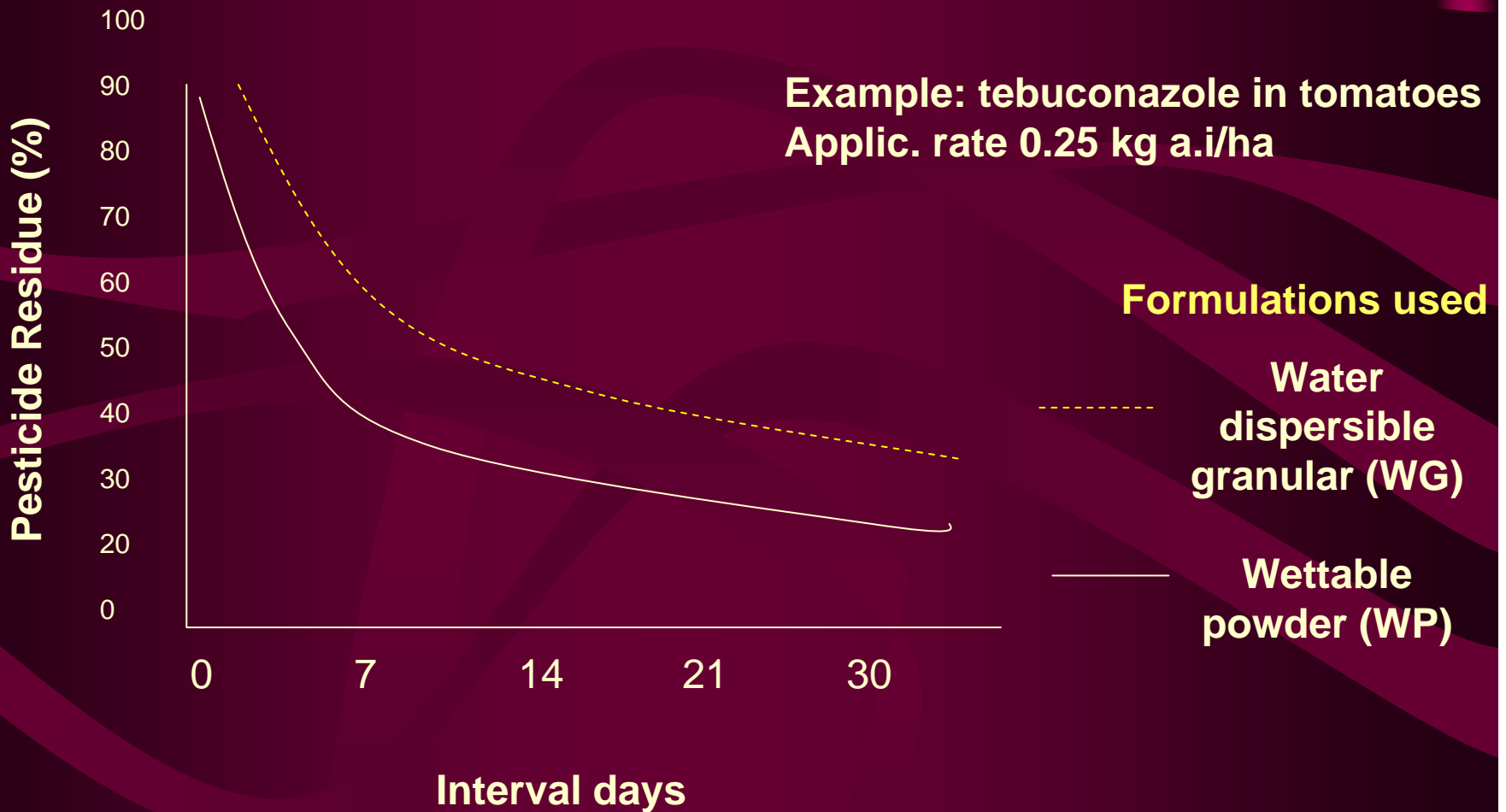
Factors influencing residue dissipation rates

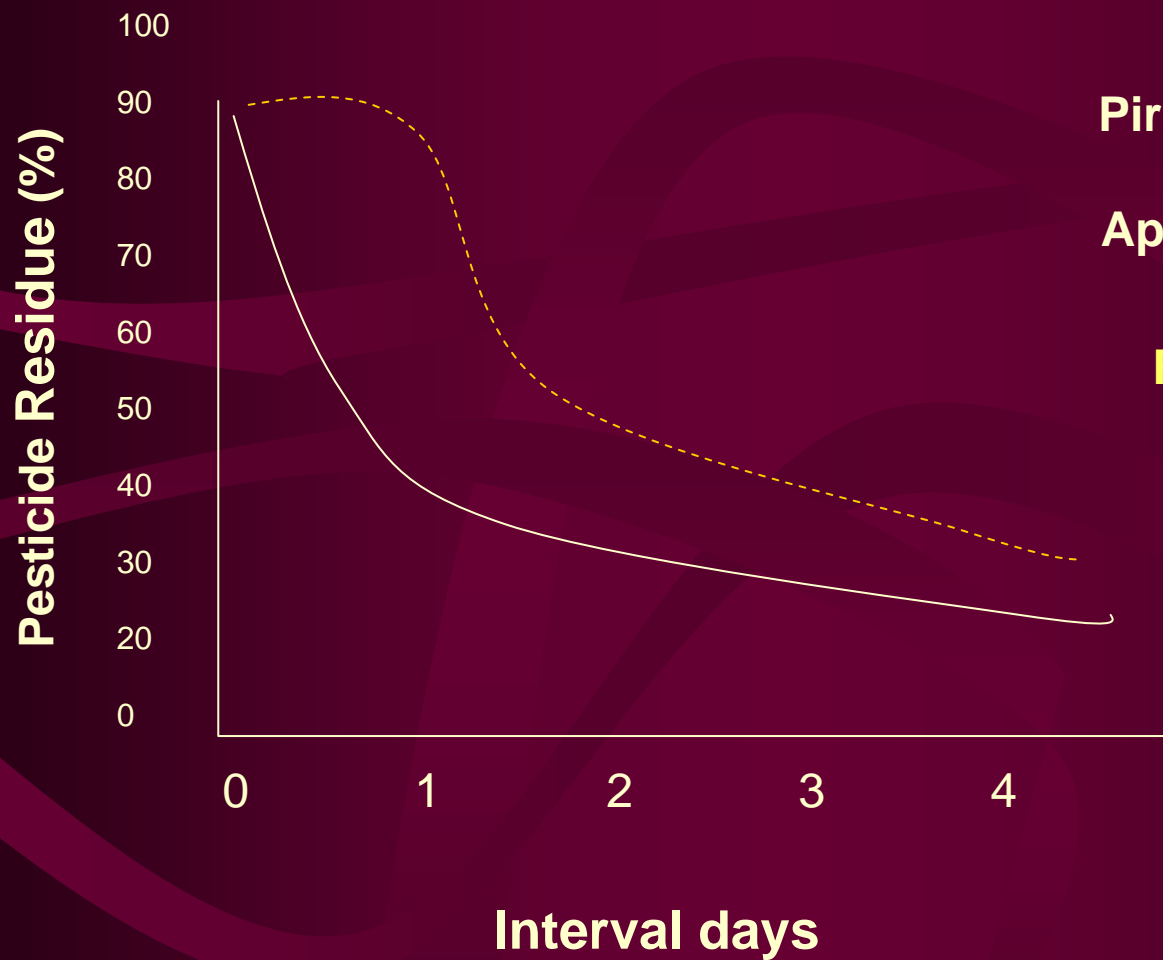
- 1.-Formulations.**
- 2.-Application factors.**
- 3.-Crop and environmental factors.**
- 4.-Residue decline factors.**

1-Formulations

- Residue trials should be conducted with the formulation to be marketed (or one of similar type and composition).**
- Minor changes are observed among the following pairs: WP-SC; WG-CS; EW-SP**
- Major changes: EC and all others (particularly with WP and micro granular formulations).**

The pesticide formulation factor.



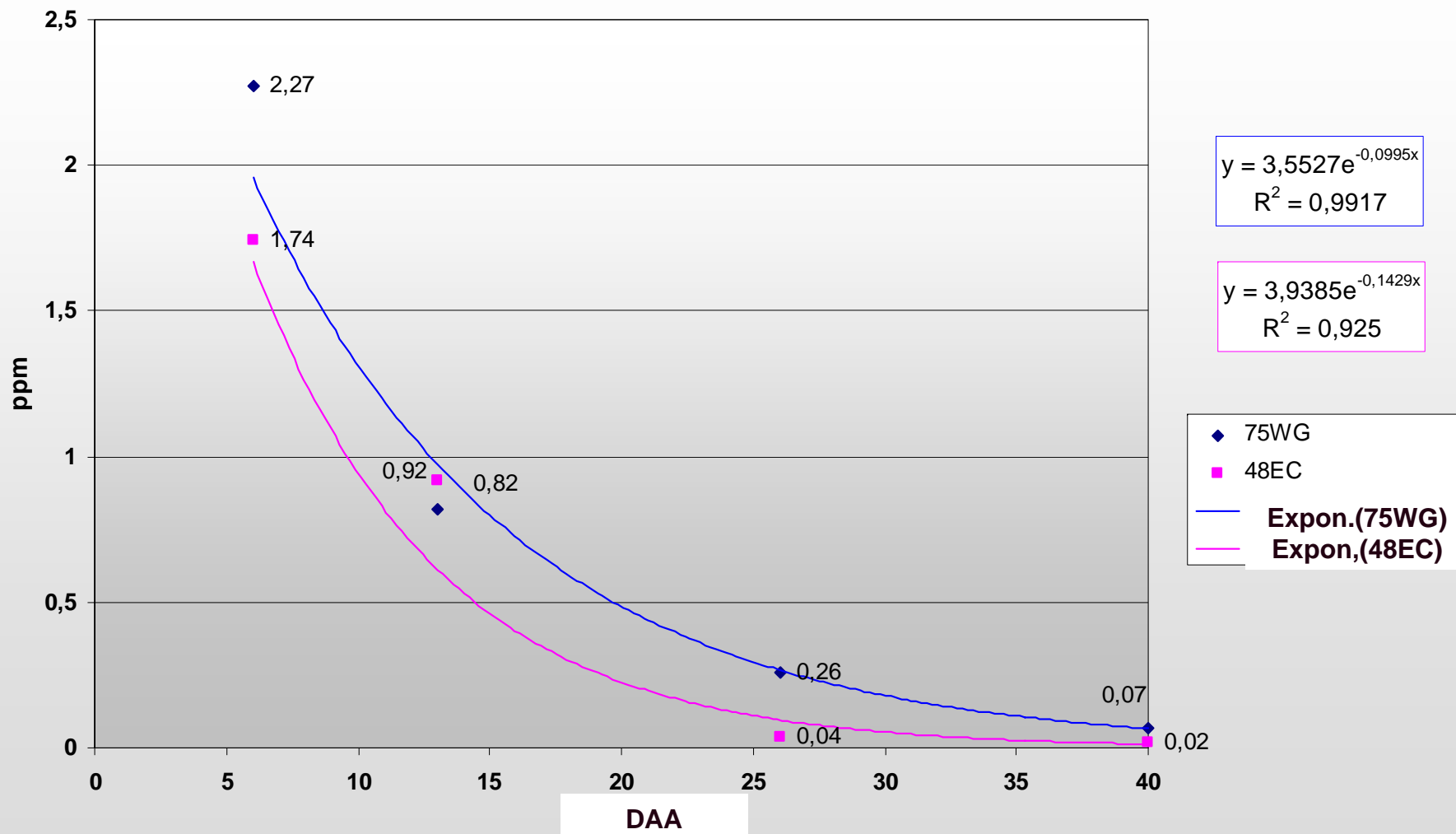


**Pirimiphos-methyl
Lettuce
Aplic.rate 280 ppm**

Formulations used

- EC**
- SC**

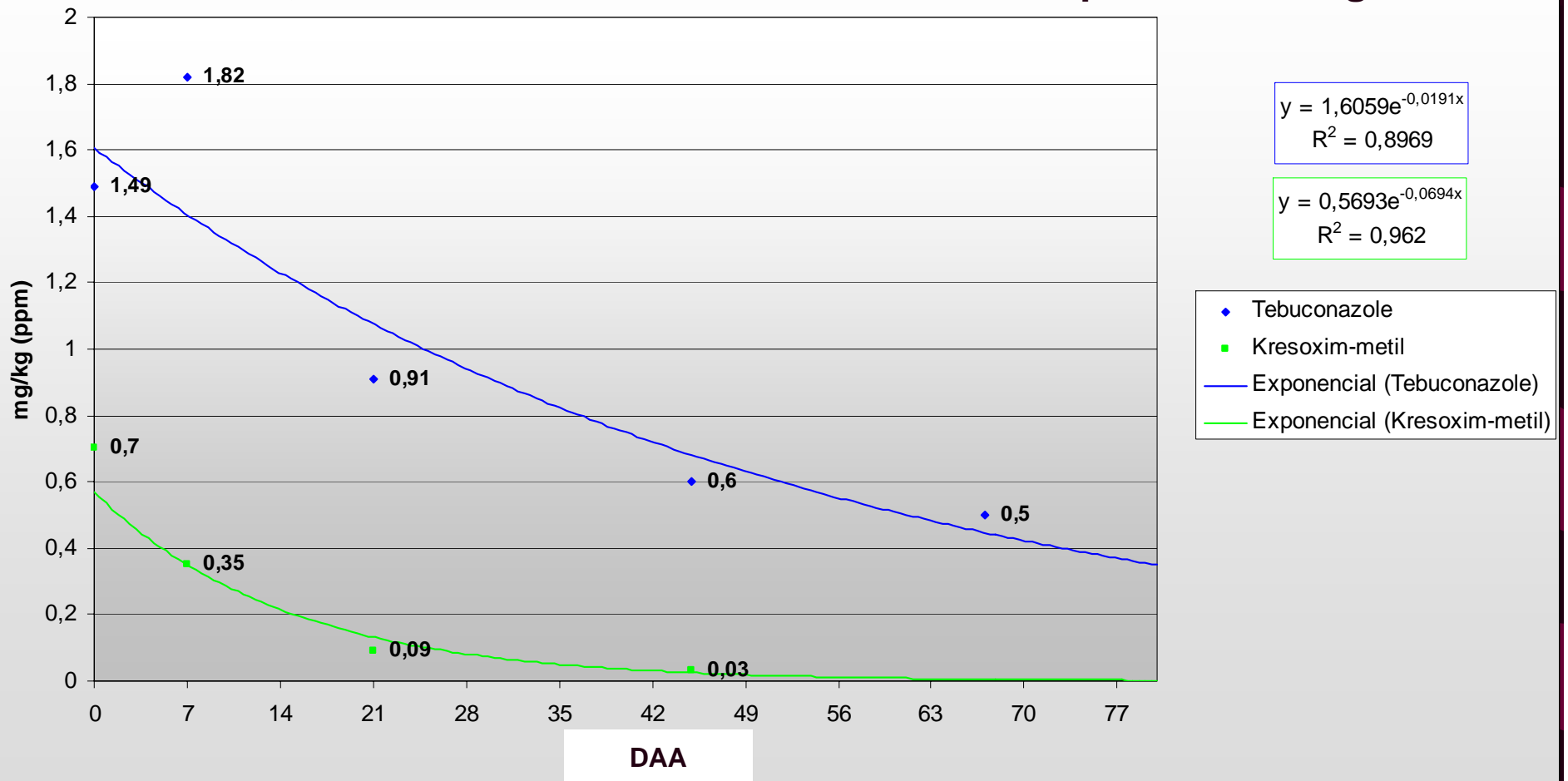
Chlorpyrifos: 48 EC and 75 WG, table grapes, Ovalle, Chile. 2003-2004 Season



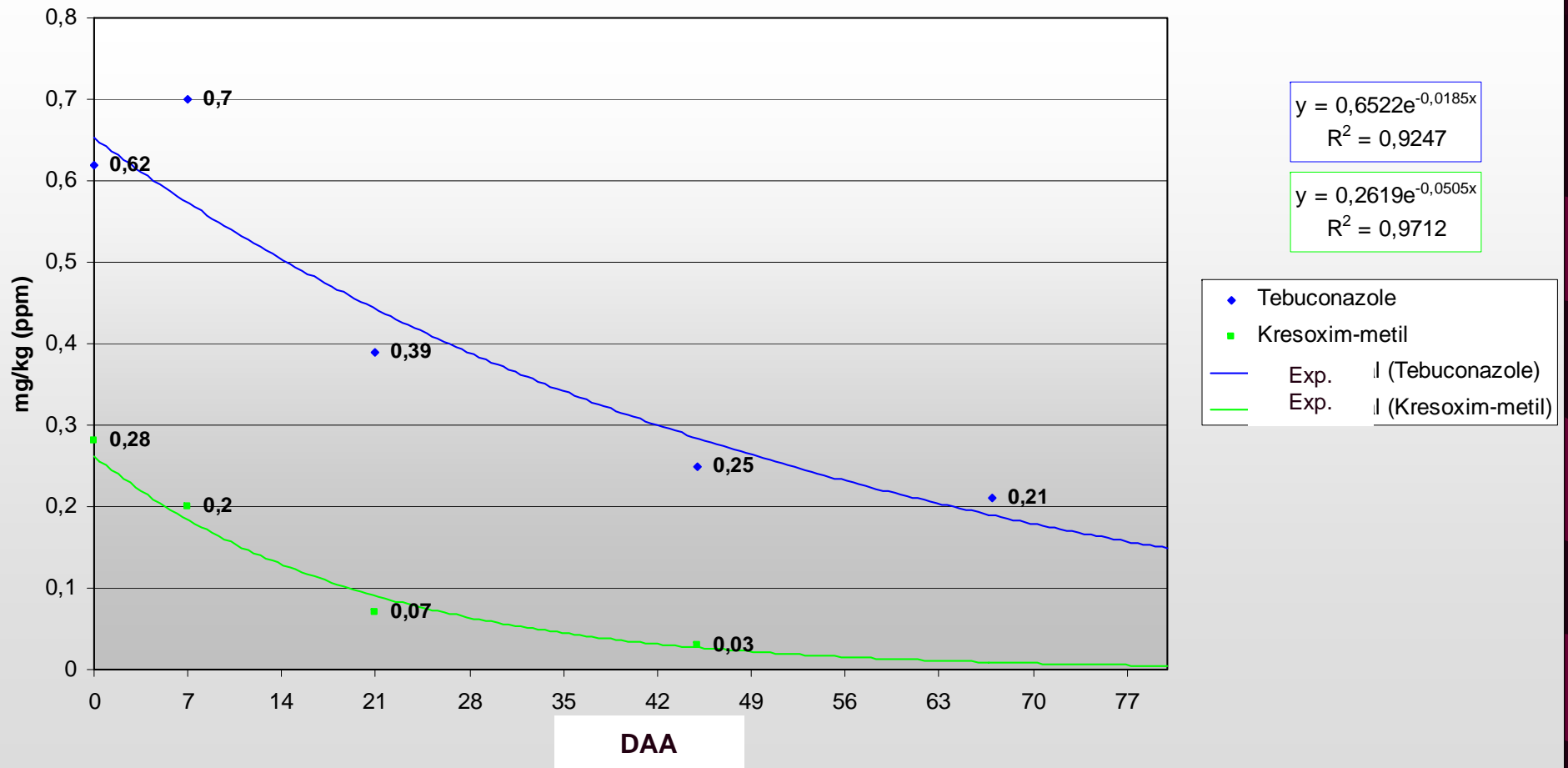
- **2-Application factors: dose, sprayer, number of applications, use of coadyuvants, etc.**
- **3-Crop and environmental factors: canopy, crop phenology, and plant growth rate, distance of planting (number of plants/ha), weather conditions**
- **4- Dissipation factors: evaporation (heat), wind, rates of pesticide absorption (contact vs. systemic), biochemical dissipation factors, etc.**
- **Soil dissipation factors include moisture at the time of application, irrigation systems, rainfall, etc.**

Residue decline of tebuconazole+kresoxim-methyl at a high dosage per hectare in table grapes.

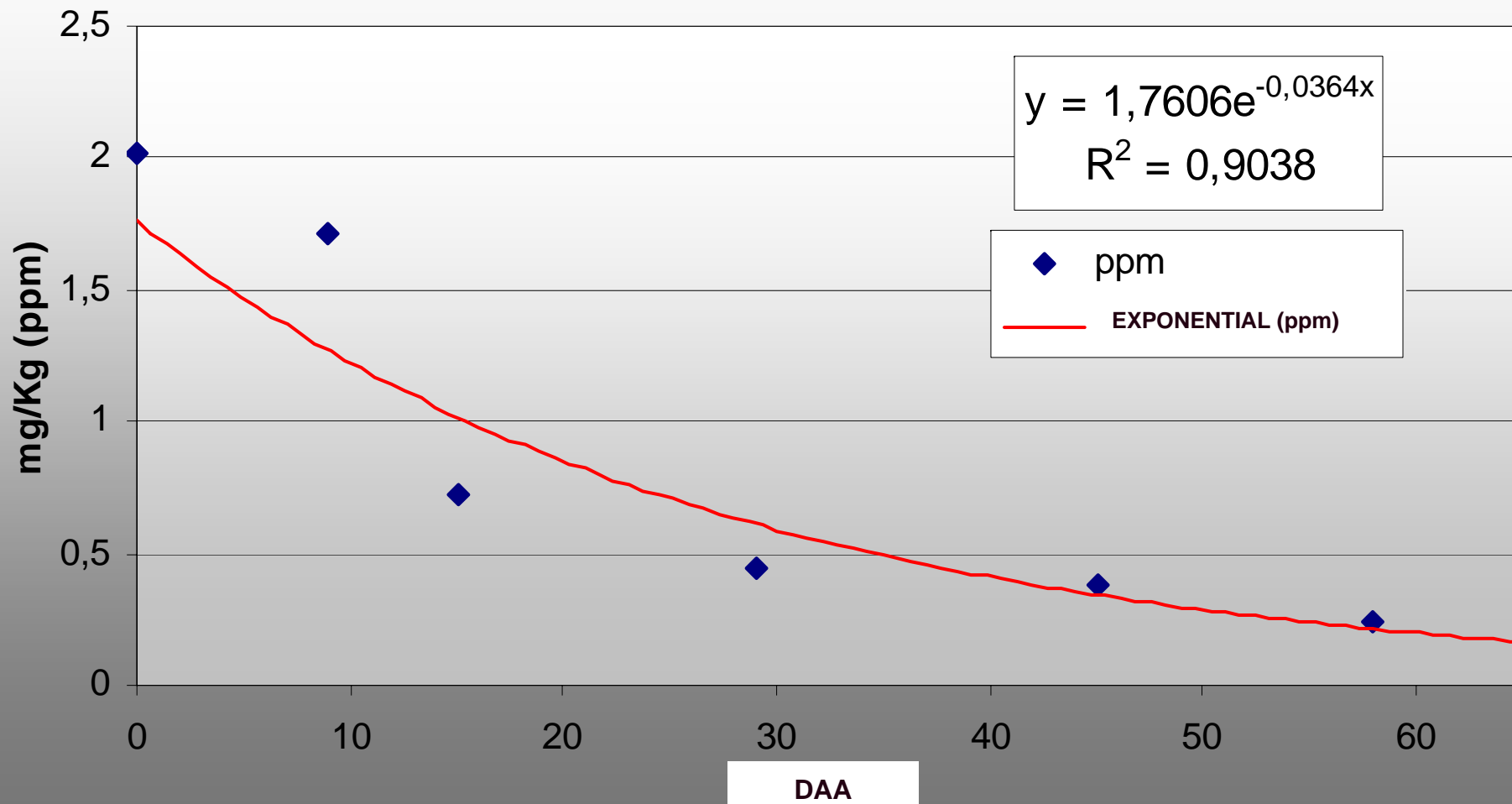
Los Andes, Chile. 2006-2007 season .Tebuconazole, persistent fungicide.



Residue declination of tebuconazole+kresoxim-methyl at lower dosage per hectare in table grapes. Los Andes, Chile. 2006-2007 season.



Persistent insecticide imidacloprid, table grapes, Los Andes, Chile. 2005-2006 season.



Comparability of residue data.

- **-Recurrent discrepancies among trials conducted in minor crops.**
- **-Pesticide use patterns (dosages and number of applications). Example mancozeb in potatoes: 5 to 10 applications, 1.5 versus 2.5-3 kg. a.i/hectare.**
- **-The principle of zoning appears to be used by many national regulatory authorities but trials from outside of their geographic areas would not often be considered as applicable.**
- **-GAP definition originally set only for pesticide residue purposes has been widely broadened to include a number of other components which do not properly fit whitening the original concept.**

Sampling methods for supervised trials.

- **-The best information about the residue behaviour of the pesticide under study would be obtained by the analysis of the entire treated crop.**
- **-Since this is not practicable, representative samples have to be taken.**
- **-Valid analytical results can only be obtained if the samples have been properly collected from different plant sites, labelled, dispatched and stored before analysis.**

- **Sampling points: all samples must be representative to enable the analytical result to be applied to the entire experimental unit.**
- **-The greater the number of plants sampled (fruits, foliage, roots, etc), the more representative the sample will be; however, there is a maximum recommended for each plant group (see below)**
- **-Damaged plant parts (by weather conditions, pests, diseases, birds) should be discarded;**

Sampling of bulb, root and tuber vegetables

Potatoes	: 12 tubers (not less than a 2 Kg. sample)
Other rootcrops	: 12 roots (not less than a 2 Kg.sample)
Leeks, bulb onions	: 12 plants
Garlic, shallots	: 12 bulbs from 12 plants.

Sampling of fruits

Citrus fruits, pome fruits, large stone fruits	12 fruits from several places on 4 individual trees (not less than 2 Kg)
Misc.fruits, e.g. avocado, guavas, mango, pomegranate, persimmons, kiwifruit, litchi.	Same as above
Strawberries, gooseberries.	1 Kg from several plot areas.
Bananas	24 fruits units (2 fingers each from top)
Coconut	12 nuts
Tree nuts (walnuts, almonds)	1 Kg.

Sampling of other vegetables

Large brassica crops (cabbage)	12 plants
Cucumber	12 fruits from 12 separate plants
Gherkins, courgettes, squash	12 fruits from 12 plants (sample not less than 2 Kg)
Melons, water melons	10 fruits from 10 separate plants
Sweet corn	12 ears

Sampling of other vegetables

Tomatoes, peppers	24 fruits from small fruiting varieties, 12 fruits from large size varieties. From 12 plants in all cases
Lettuce, endive	12 plants
Asparragus	12 sticks from 12 separate plants
Globe artichoke	12 heads
Beans, peas (fresh)	1 Kg (fresh green)
Dried beans, lentils, pulses, etc	1 Kg

Sampling methods

- -At random
- -Systematically, e.g., field crops collect samples in a diagonal “X” pattern
- -Samples from fruit trees should be collected from 3-6 trees, clipping fruits off from inside and outside canopy.

Sampling at normal harvest time.

- Take samples so as to be representative of typical harvesting practice;
- Avoid taking diseased or undersized crop parts or commodities at a stage when they would not normally be harvested;
- Take bush or tree fruit samples from all segments of the plant, high and low, exposed and protected by foliage.

Warnings

- **-Avoid taking samples at the beginning or at the extreme end of plot.**
- **-Take and bag the required weight or units and do not subsample until the samples are in a clean table or better in the lab facilities.**
- **-Samples can be transported in an ice box and stored at -20°C until they are sent to the lab.**
- **Vegetables: take samples from all over the plot (bulb, root and tuber vegetables), excluding at least 1 meter at the edges of the plot and the end of the rows. Adhering soil may have to be removed.**

Warnings, cont'd.

- Do not trim except for the removal of obviously decomposed or withered leaves
- Label sample bags: crop, variety, date, or a code number (to indicate treatment, application methods, coverage, climatic events, etc).

Residue data extrapolation

- **-Most specialty minor crops do not have large enough production scales for pesticide manufacturers to invest in residue trial studies.**
- **-It is therefore convenient to extrapolate data obtained from other closely related crops to avoiding possible duplication of supervised trials. Data should be obtained as possible from other crops pertaining to the same group.**

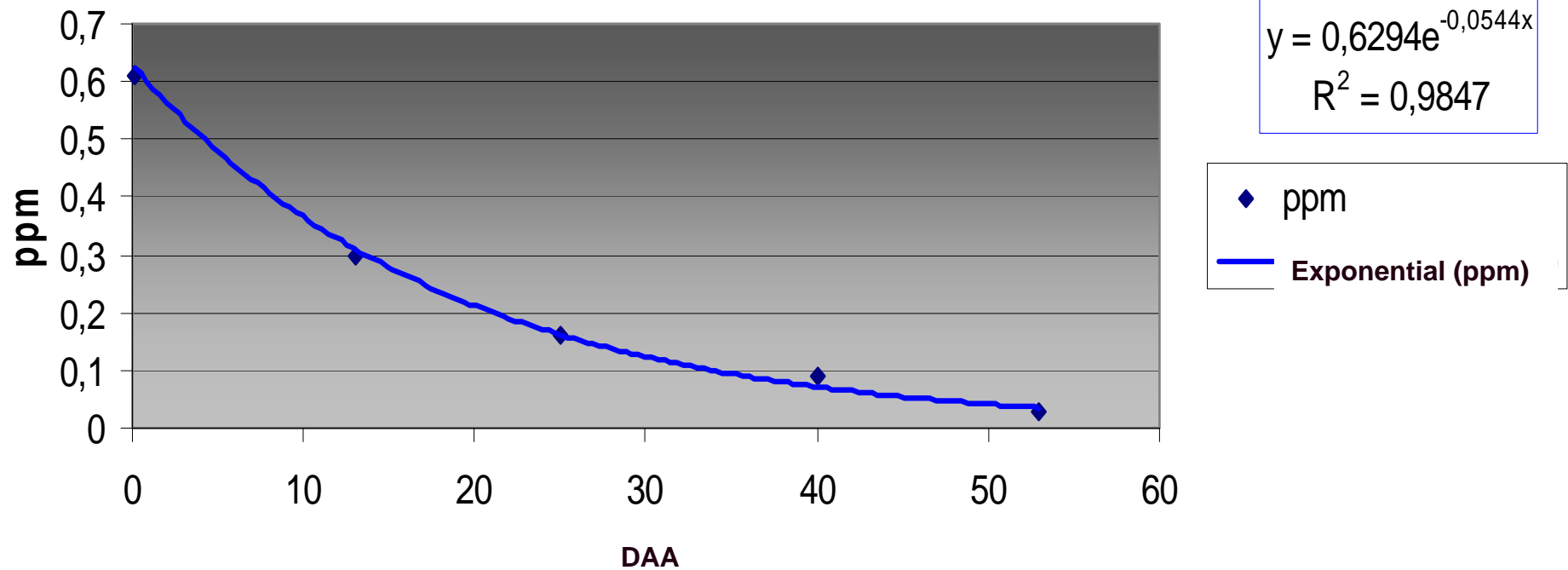
Can residue results be extrapolated to another crop?

- Provided that supervised trials are conducted on a representative commodity (of a particular crop group such as bulb vegetables, fruiting vegetables, flower heads such brassicas, brussel sprouts, etc) and in fairly close phenological stages, it could be possible to extrapolate results.

Examples...

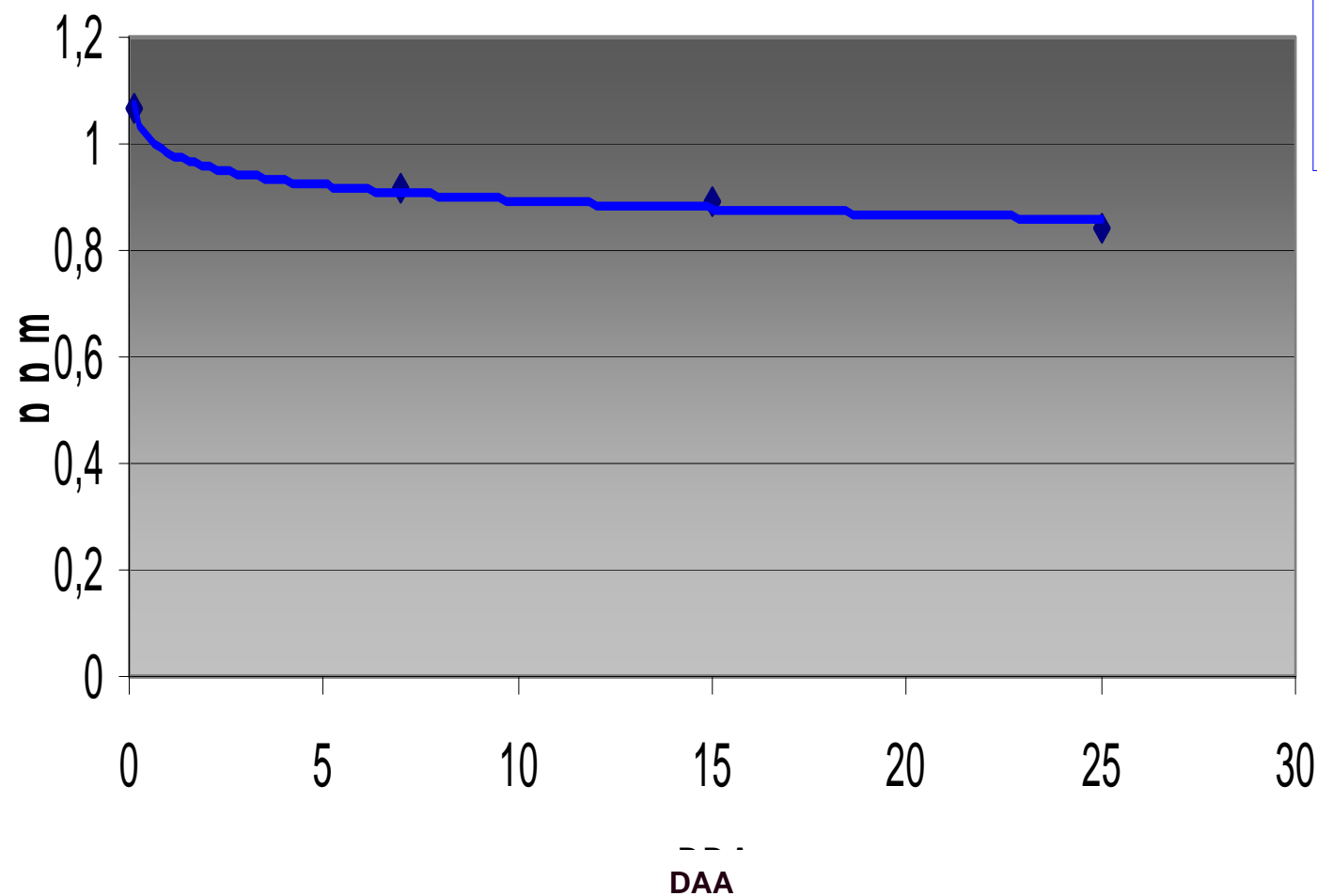
- a) citrus groups: for highly pesticides (OP's, carbamates), lemon fruits retain more residues than other family fruits.
- b) Berry groups: blueberries have a different pattern of the residue retention and dissipation than other small fruits.
- c) Data from strawberries can be extrapolated to blackberries.
- d) Cauliflower to broccoli
- e) Lettuce, depending on cultivars.
- f) Fresh herbs and spices: a pragmatic solution is to apply results set for similar major crops: extrapolation from other leaf crops (lettuce)

Residue dissipation of the fungicide fenhexamid in table grapes, Buin, Chile. 2000-2001



- **Application: Grape bunch closure. December, 2000.**
- **Teldor 50 WP: 1.2 kg commercial product/ha (600 g i.a/ha), 1200L/ha**

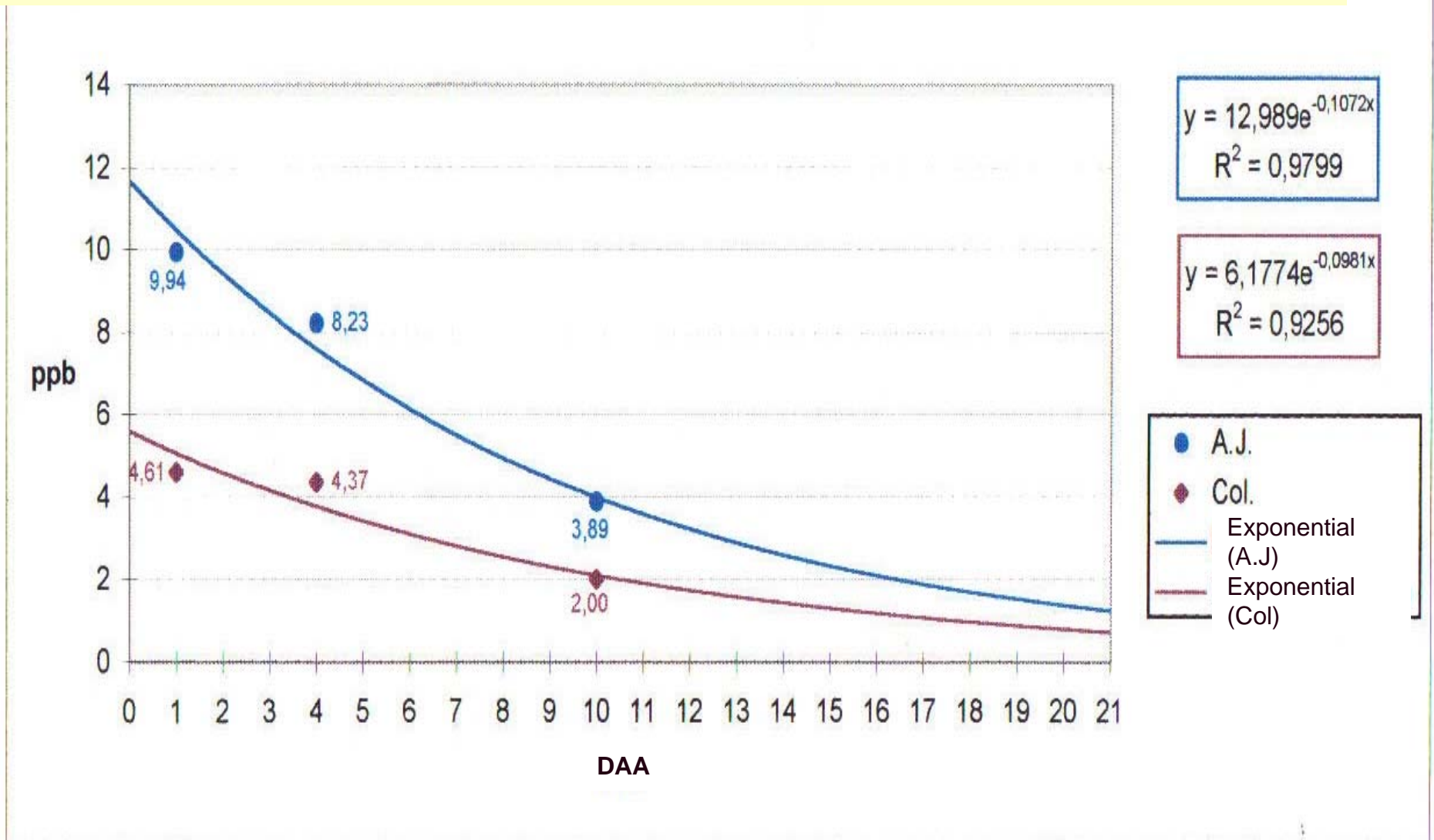
Extended persistence of dicofol residues in table grapes.



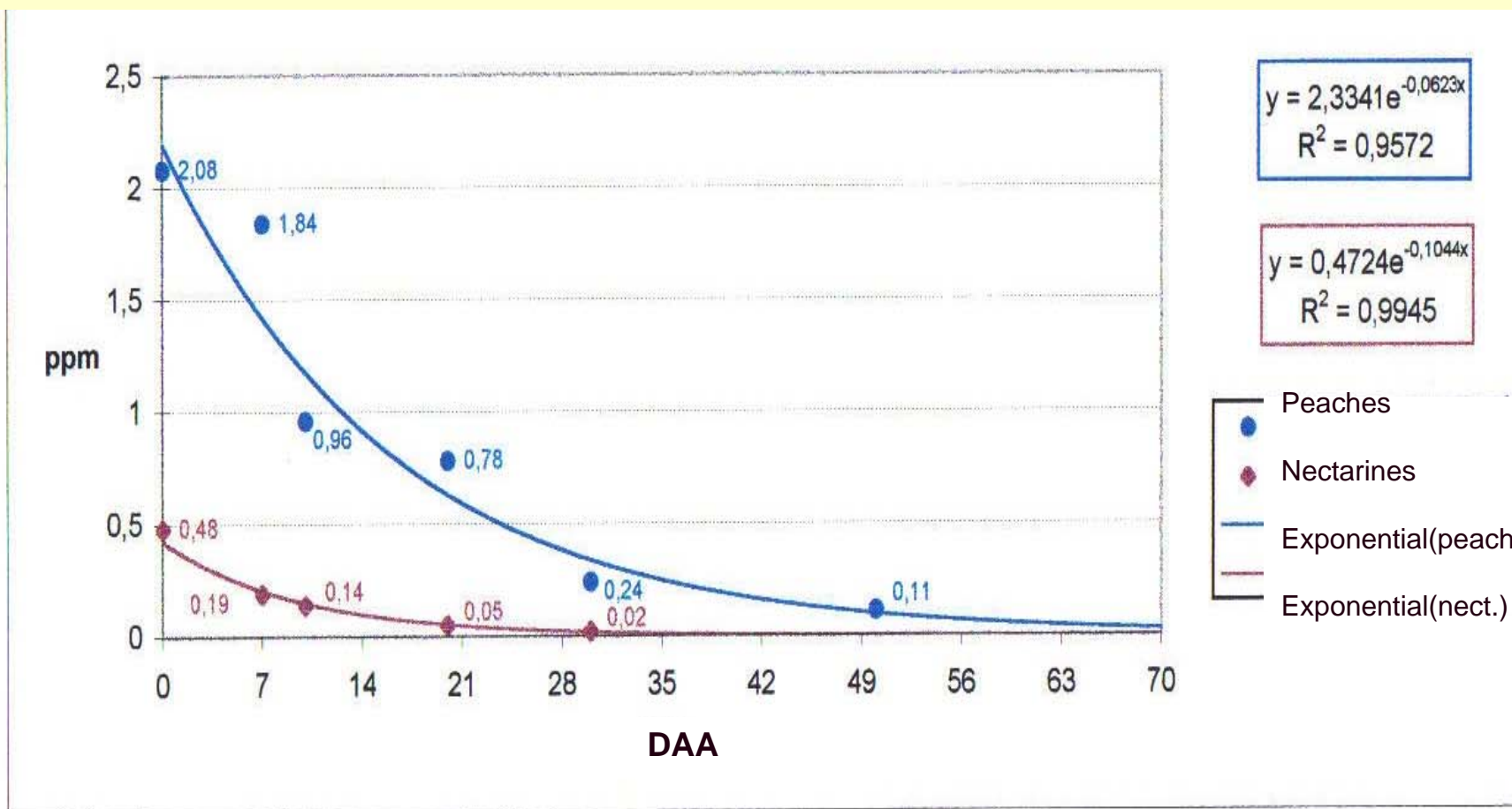
$$y = -0,0389\ln(x) + 0,9842$$
$$R^2 = 0,9785$$

◆ ppm
— Log. (ppm)

Abamectin in nectarines (Supervised trials in two close locations).



Residue decline of azinphos methyl 50 WP(100g c.p/100L) in peaches and nectarines.



Selected references

- Codex Alimentarius Commission. 2000- Pesticide Residues in Food: Methods of analysis and sampling. Vol.2^a, Part. 1, 91 p.
- FAO. 1997. FAO Manual on the submission and evaluation of pesticide residues data for the estimation of maximum residue levels in food and feed, Rome, 158 p.

- FAO 2007. Requests and Comments on the proposals for “bulb vegetables” and “fruiting vegetables”, Codex Alimentarius Commission, CL 2007/36-PR. Sept.2007,25p.