Potential Application of Processed Product Pesticide Residue Data to IESTI Process

IESTI In-Session Working Group
Codex Committee on Pesticide Residues
Haikou, China
April 9 – 14, 2018

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US CCPR Alternate Delegate

IESTI

International **E**stimate of **S**hort-**T**erm **I**ntake

(Acute Dietary Pesticide Exposure)

IESTI EWG
Terms of Reference iii

- To gather relevant information on bulking and blending, as well as other information or data as outlined in Table 3 Appendix 2 of CX/PR 17/49/12 in order to feed into the risk assessors work through the JMPR Secretariat.

IESTI EWG
Terms of Reference iii

Status:

- The work was not completed.
- No data on bulking and blending practices have been provided to date.
- EWG members have requested more information on the type of data that is being called for.

Presentation Objectives

- Demonstrate potential application of Processed Product Pesticide Residue Data to the development and validation of IESTI equation parameters
  - Emphasis on case 3 for bulked and blended products

Presentation Format

- Provide an overview of the current uses of STMR and HR in the IESTI equations

- Share illustrative examples of bulking and blending in oranges/orange juice and wheat/wheat flour, using real-world monitoring data

Current uses of STMR and HR in the IESTI equations

IESTI Equations

<u>Case 1</u>
Unit Weight (U_{RAC}) < 25g
Example: Green Beans

<u>Case 2a</u>
Unit Weight (U_{RAC}) $\geq$ 25g
Edible Portion (U_e) < Large Portion
Example: Oranges

<u>Case 2b</u>
Unit Weight (U_{RAC}) $\geq$ 25g
Edible Portion (U_e) $\geq$ Large Portion
Example: Watermelon

<u>Case 3</u>
Bulked/Blended Commodity
Example: Orange Juice

IESTI Equations
Estimate of Acute Pesticide Intake (Exposure)

Intake = Pesticide Concentration X Consumption

Intake = (µg pesticide/gram commodity) X (gram commodity/kg_{bw})

Intake = (µg pesticide/~~gram commodity~~) X (~~gram commodity/~~kg_{bw})

Intake = (µg pesticide/kg_{bw}) per day

IESTI Equations
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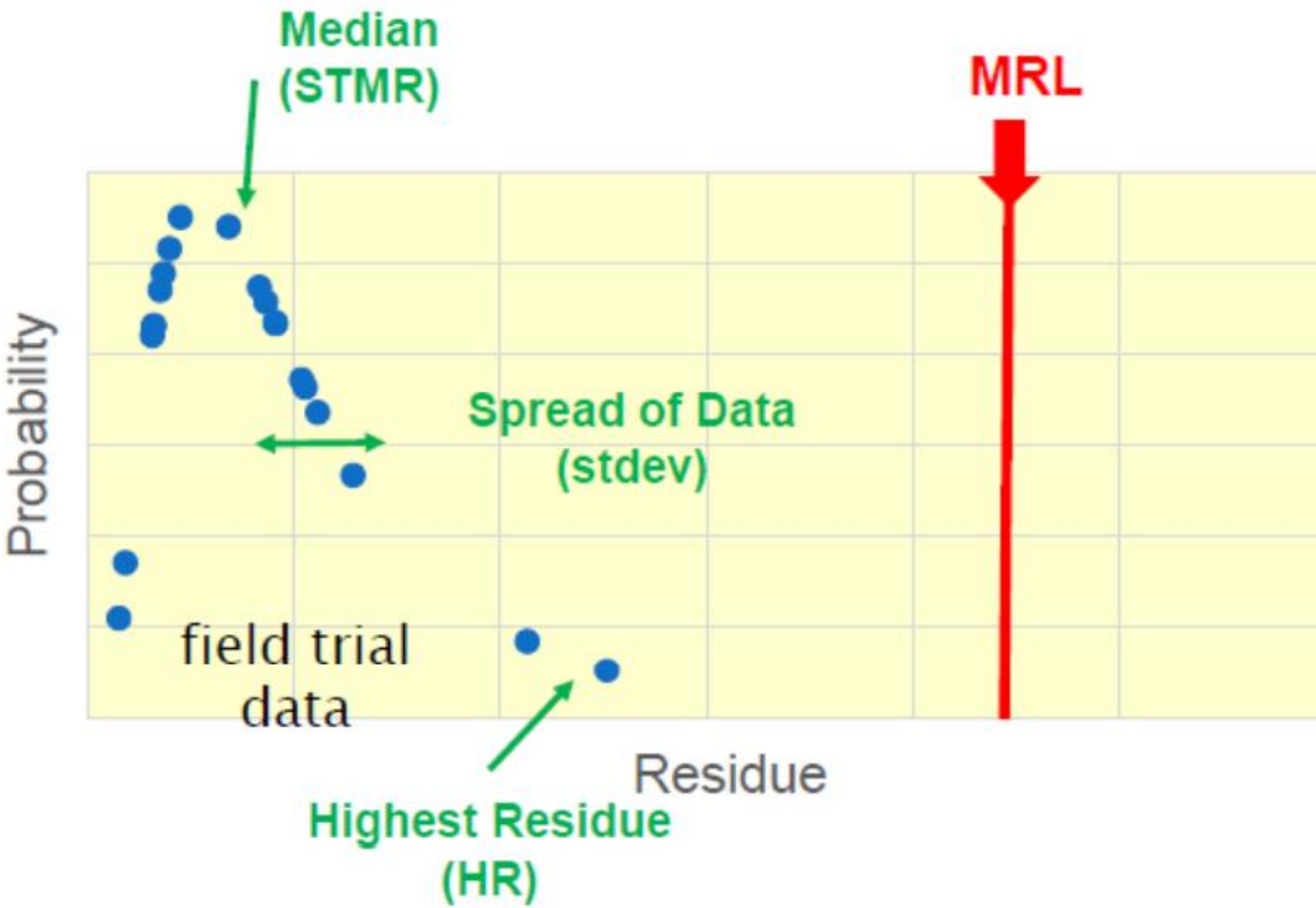
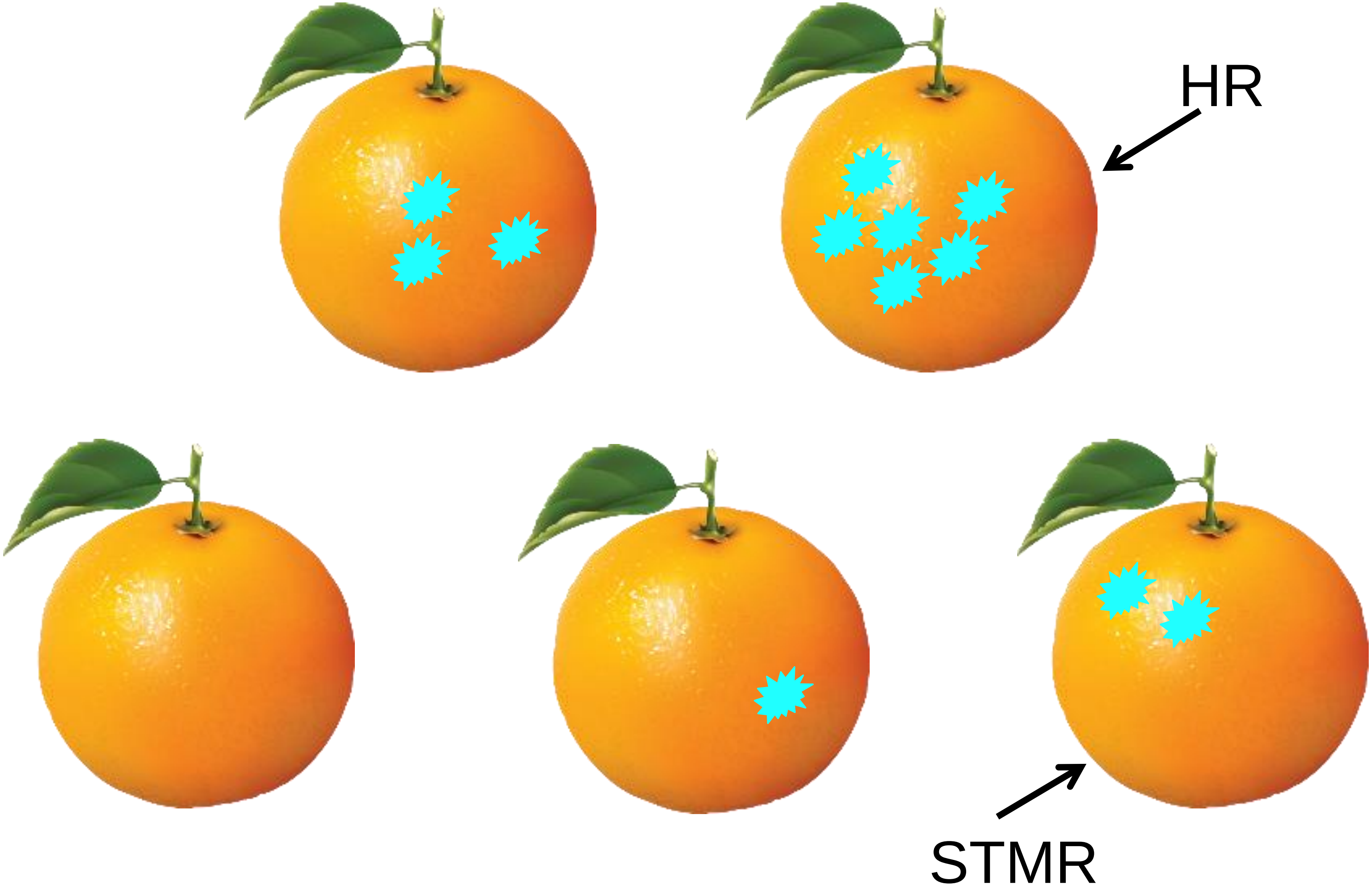
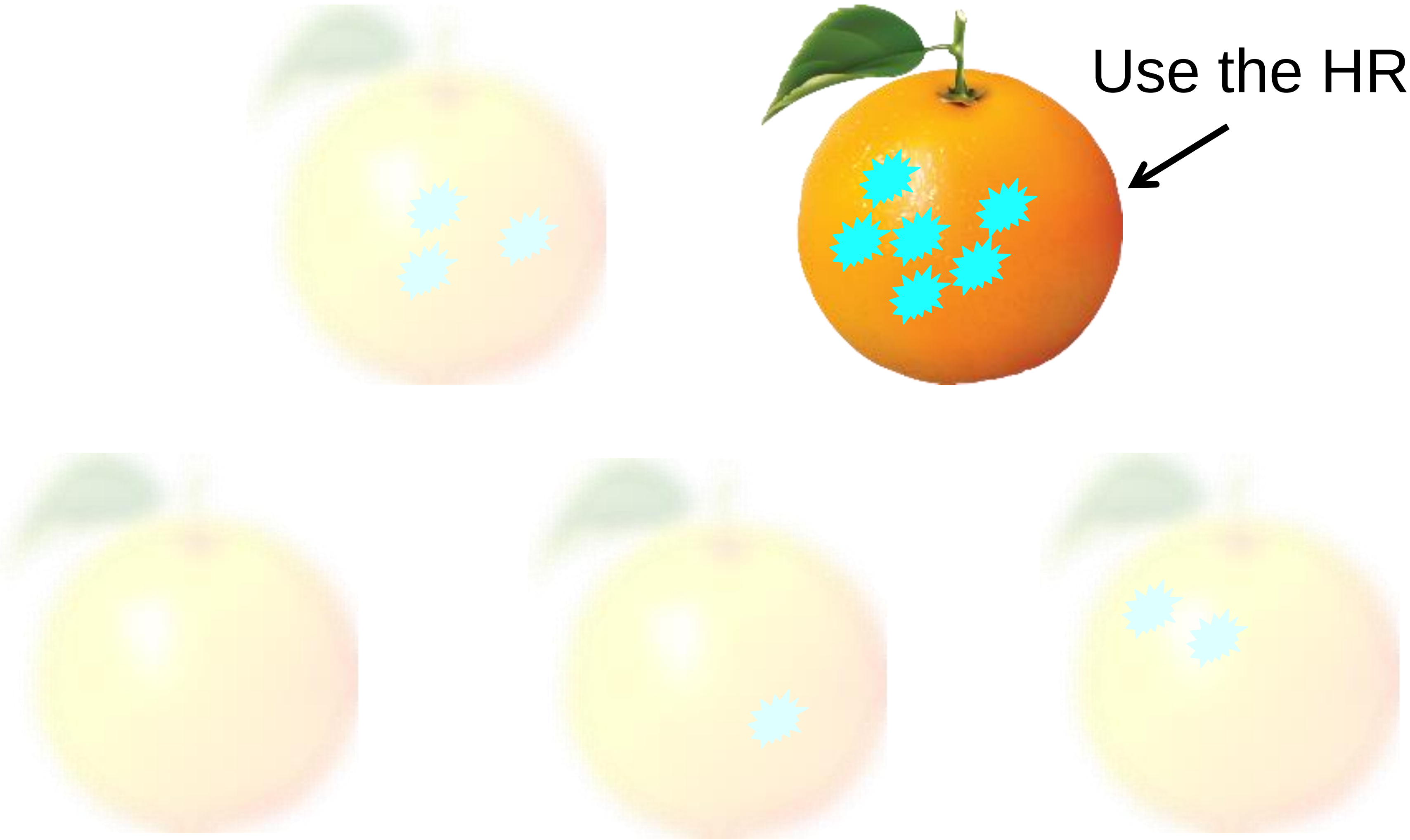
Supervised Field Trials


Median
(STMR)
MRL
Probability
Spread of Data
(stdev)
field trial
data
Residue
Highest Residue
(HR)

HR & STMR



IESTI for an Orange

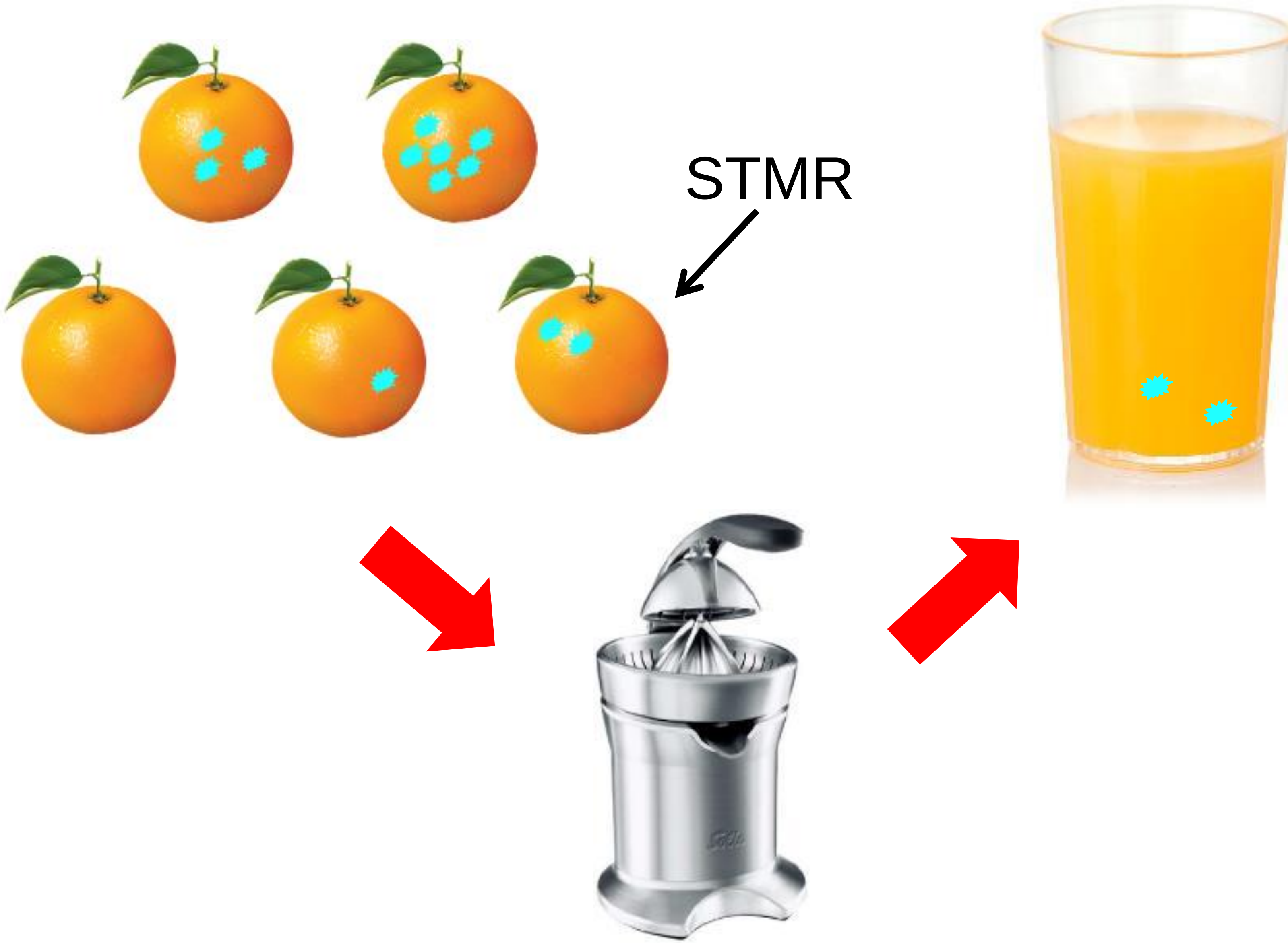


$$\mathrm{IESTI} = \frac{(U_e \times HR) \times v) + ((LP - U_e) \times HR)}{bw}$$

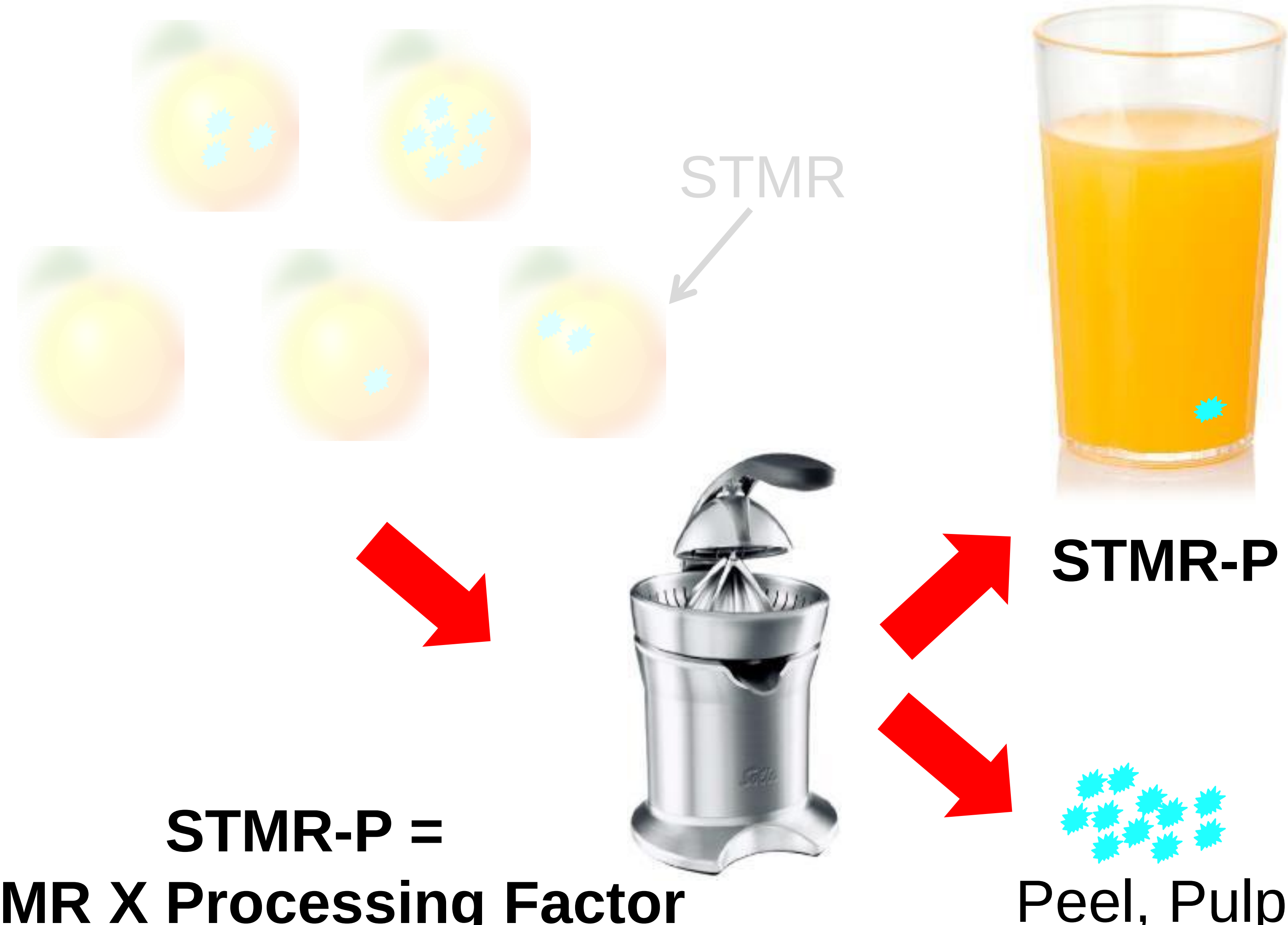
IESTI for Bulked or Blended Commodities

$$IESTI = \frac{(LP \times STMR\text{-}P)}{bw}$$

IESTI for Orange Juice

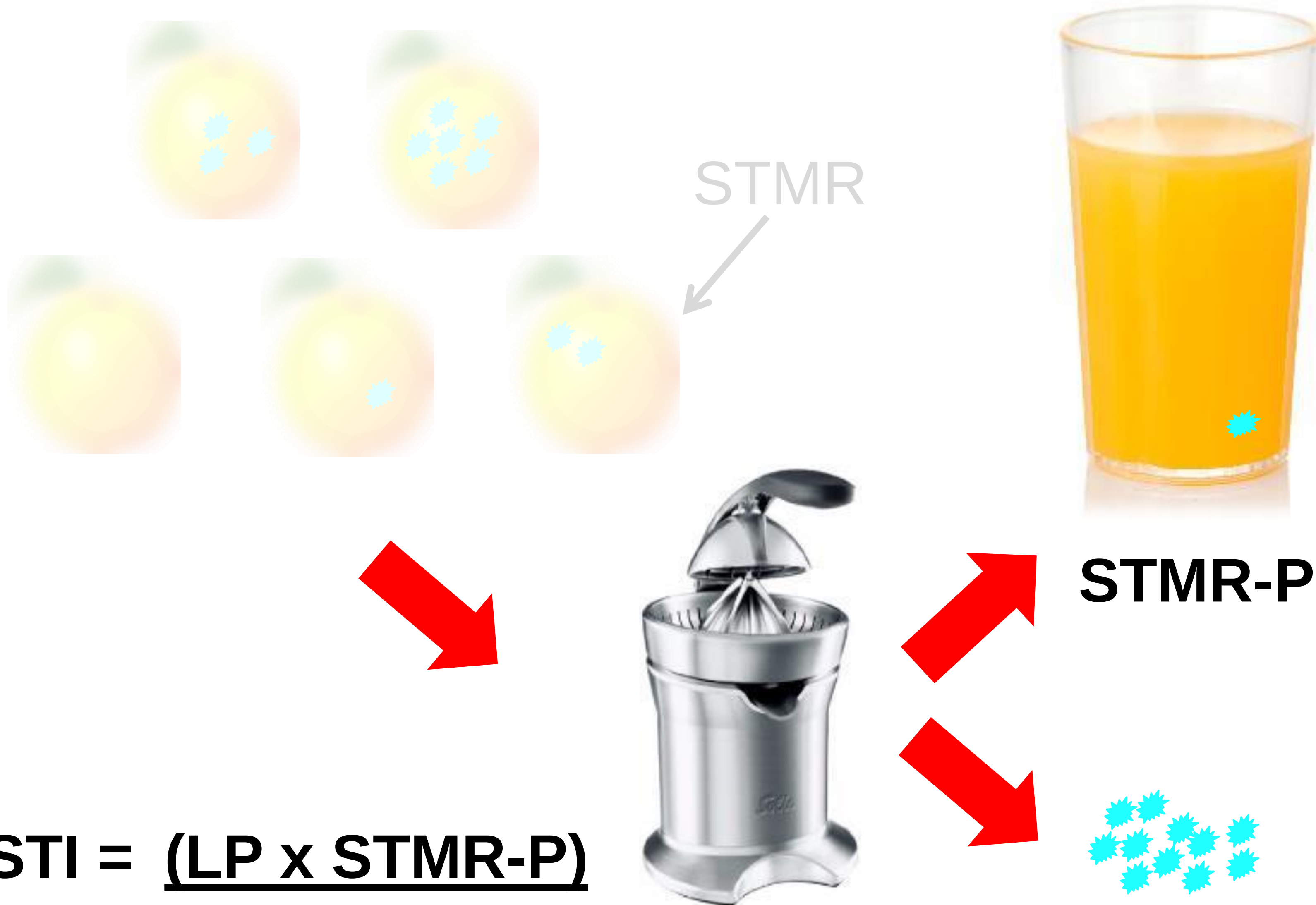


IESTI for Orange Juice



STMR-P =
STMR X Processing Factor

IESTI for Orange Juice



$$\text{IESTI} = \frac{(\text{LP} \times \text{STMR-P})}{\text{bw}}$$

Illustrative example of bulking and blending in oranges and orange juice, using real-world monitoring data

Bulking and Blending in Practice: Orange Juice

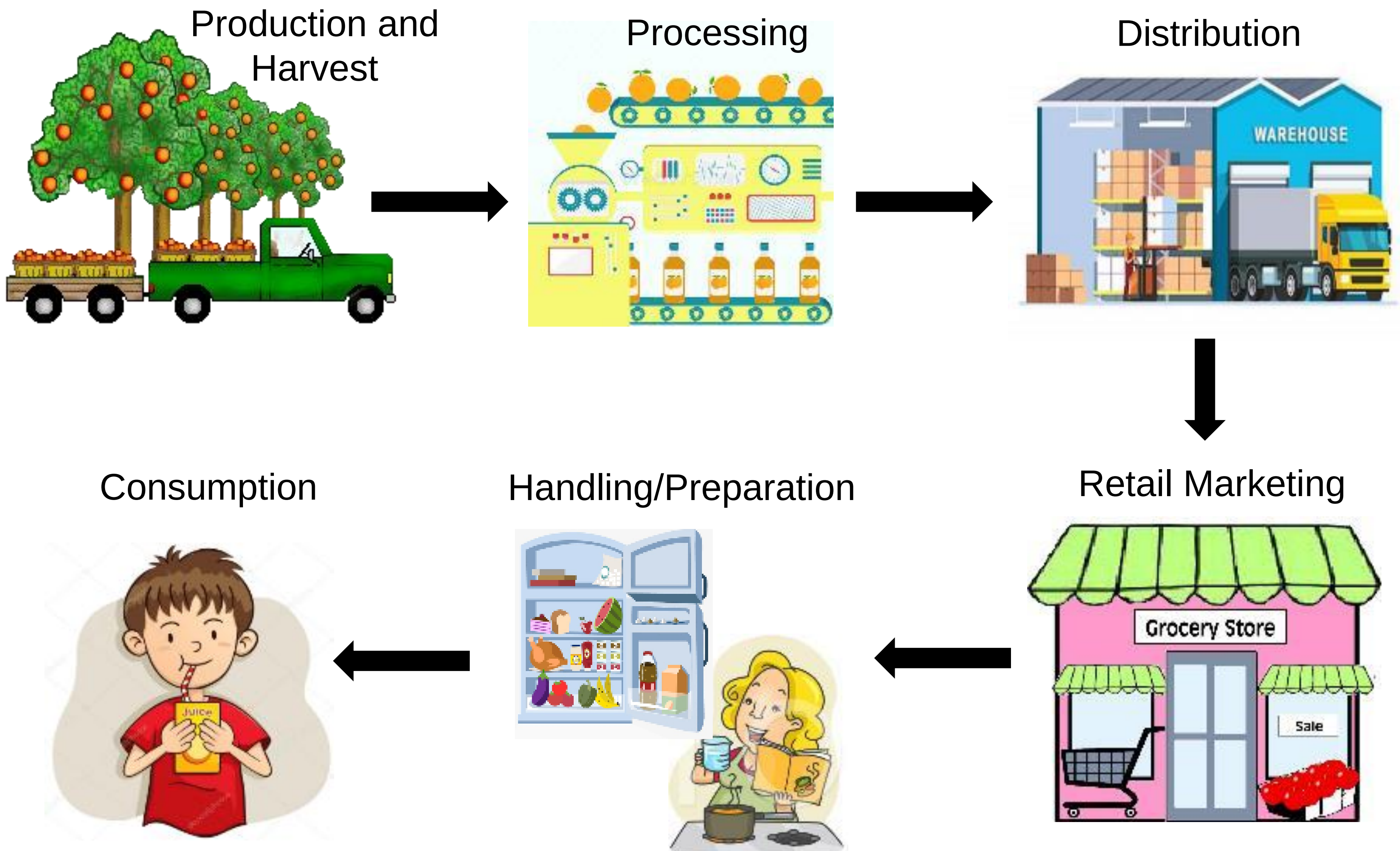


Farm → Harvest → Cleaning and Sorting

→ Extraction → Pasteurization → Filling and Packaging



$\textbf{Pesticide Residue}_{\textbf{Farm}} \neq \textbf{Pesticide Residue}_{\textbf{Processed Product}}$



$\text{Pesticide Residue}_{\text{Farm}} \neq \text{Pesticide Residue}_{\text{Processed Product}}$

USDA's Pesticide Data Program (PDP) measures residues from samples collected at distribution and retail centers.

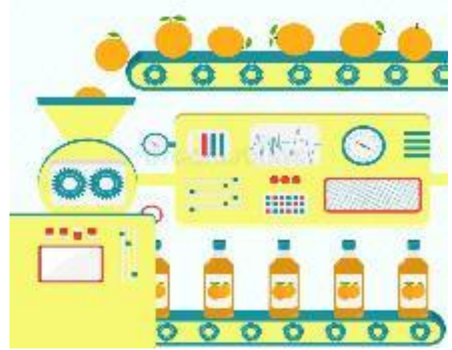
These pesticide concentrations are better for estimating exposure than concentrations on raw commodities at the time of harvest.

Distribution

Retail Marketing

$\textbf{Pesticide Residue}_{\textbf{Farm}} \neq \textbf{Pesticide Residue}_{\textbf{Processed Product}}$

Processing



PDP monitoring data can provide valuable insights in to how residue concentrations may be substantially changed under real-world conditions, particularly during processing.

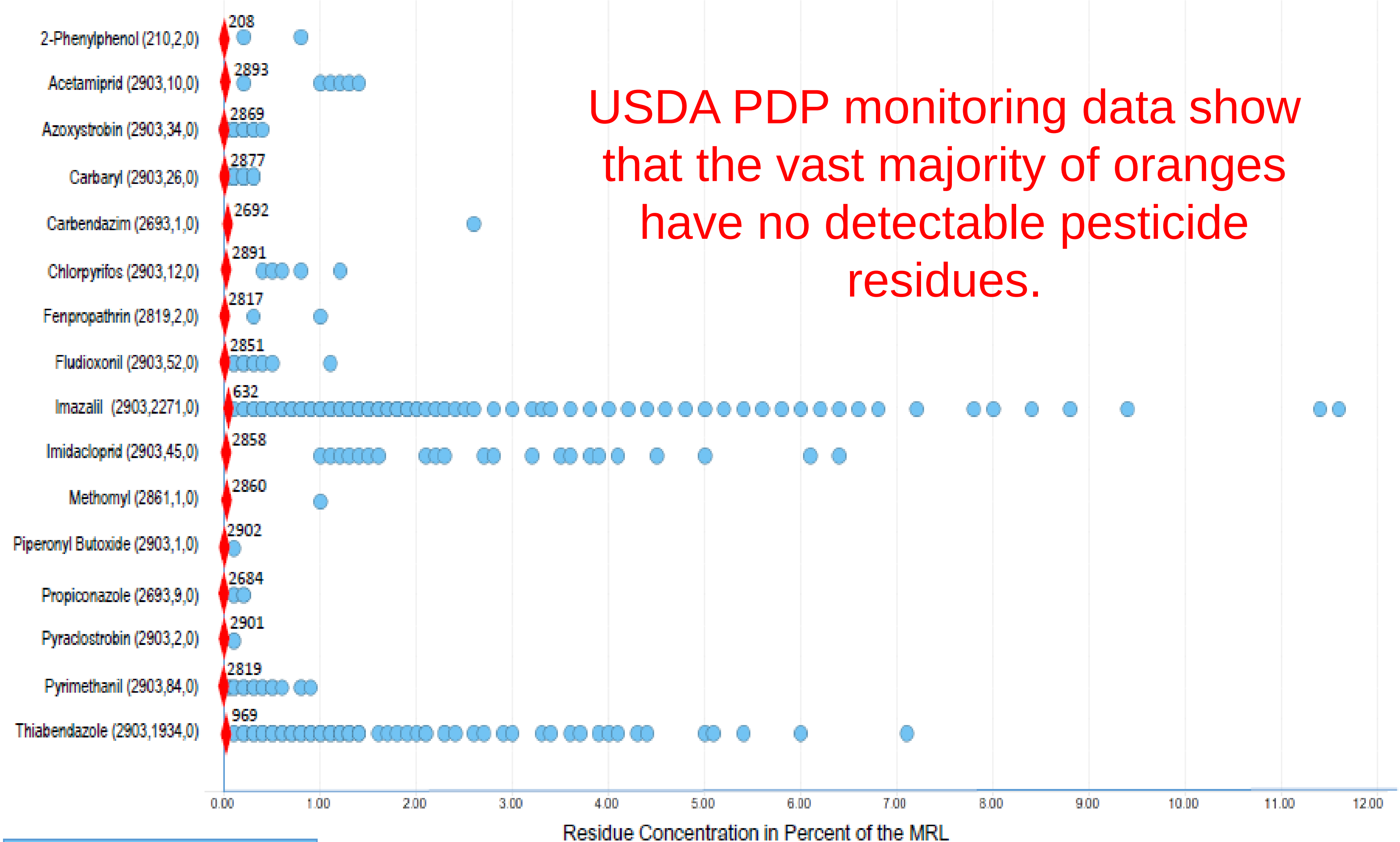
USDA PDP Data for Oranges

- Oranges collected at distribution and/or retail centers in 2009, 2010, 2015, 2016.
- 81 compounds were identified as having Codex MRLs established for oranges/citrus.
- PDP tested for 58 of those 81 compounds in oranges.
- Only 16 of the 58 compounds had reported positive residue detections in oranges.

Distribution

Retail Marketing

Orange Residue Distribution Summaries with Comparison to CODEX Maximum Residue Level (MRL)

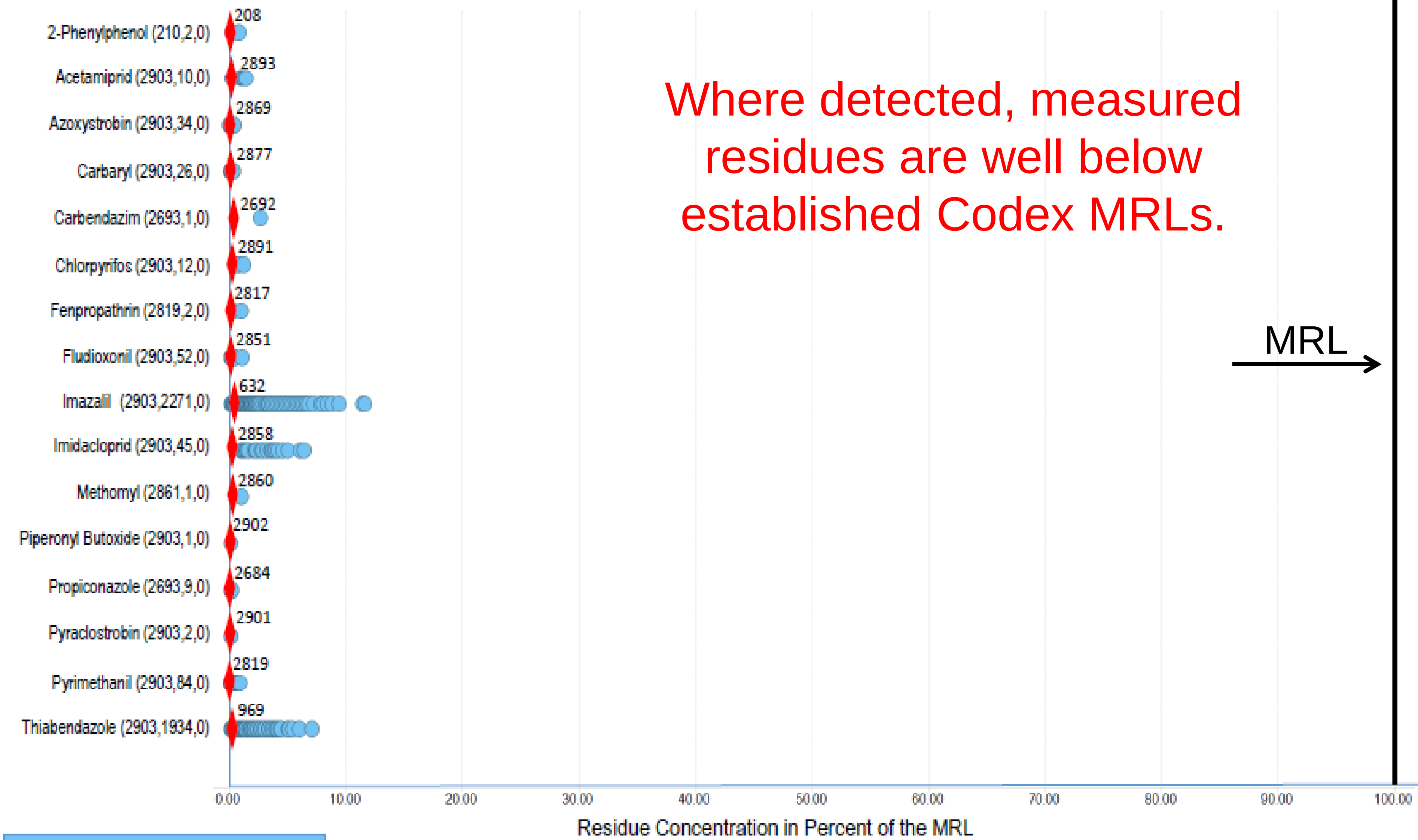


USDA PDP monitoring data show that the vast majority of oranges have no detectable pesticide residues.

Pesticide (x,y,z)
x = Total Number of Samples Tested
y = Number of Samples <= MRL
z = Number of Samples > MRL

= Number of NDs
♦ = Percent of mean detection to MRL (NDs = ½ LOD)

Orange Residue Distribution Summaries with Comparison to CODEX Maximum Residue Level (MRL)



Pesticide (x,y,z)
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= Number of NDs
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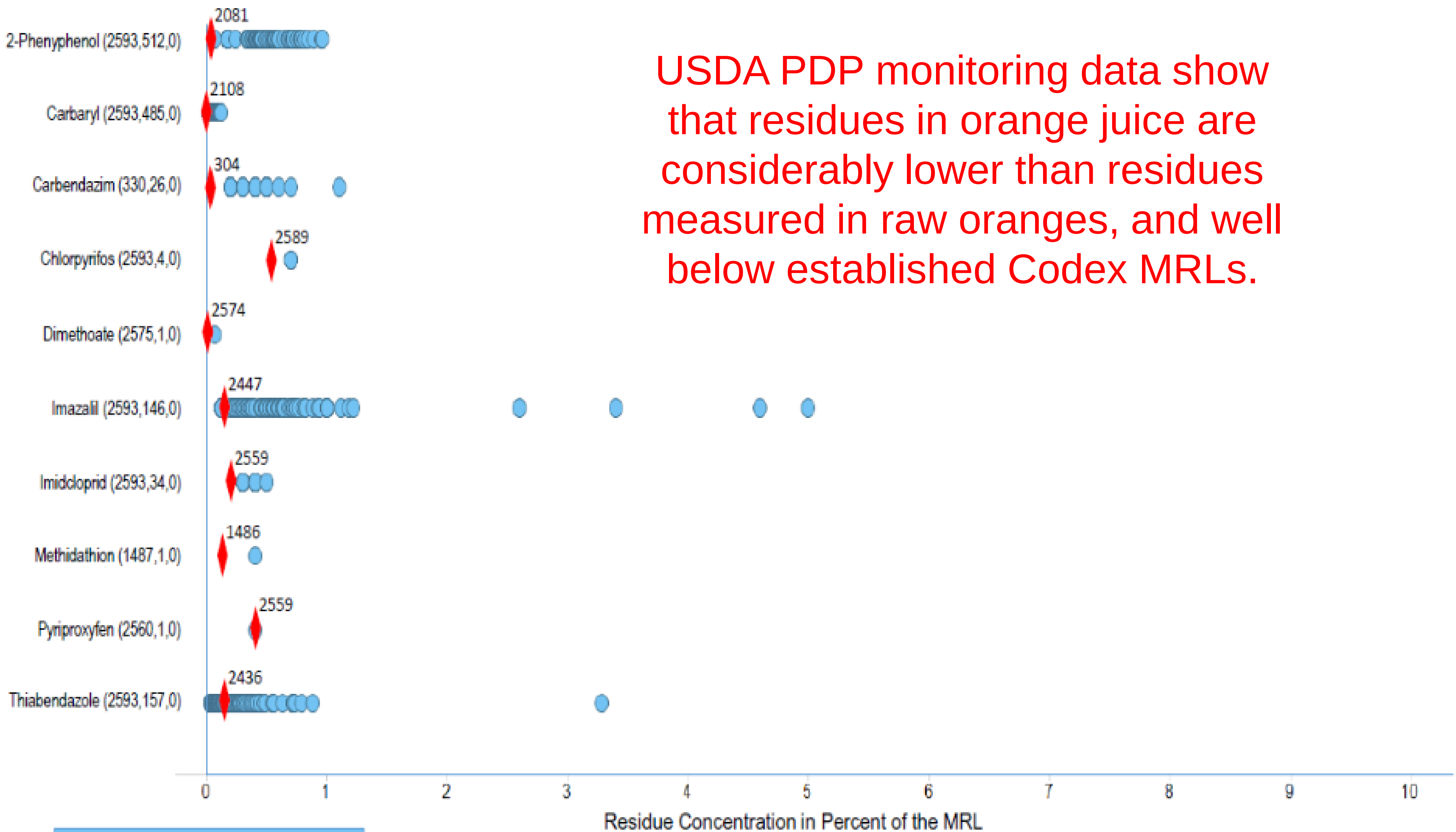
USDA PDP Data for Orange Juice

- Orange juice collected at distribution and/or retail centers in 2004, 2005, 2006, 2010, 2011, 2012.
- 81 compounds were identified as having Codex MRLs established for oranges/citrus.
- PDP tested for 51 of those 81 compounds in oranges.
- Only 10 of the 51 compounds had reported positive residue detections in orange juice.

Distribution

Retail Marketing

Orange Juice Residue Distribution Summaries with Comparison to CODEX Maximum Residue Level (MRL)



USDA PDP monitoring data show that residues in orange juice are considerably lower than residues measured in raw oranges, and well below established Codex MRLs.

Pesticide (x,y,z)
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y = Number of Samples <= MRL
z = Number of Samples > MRL

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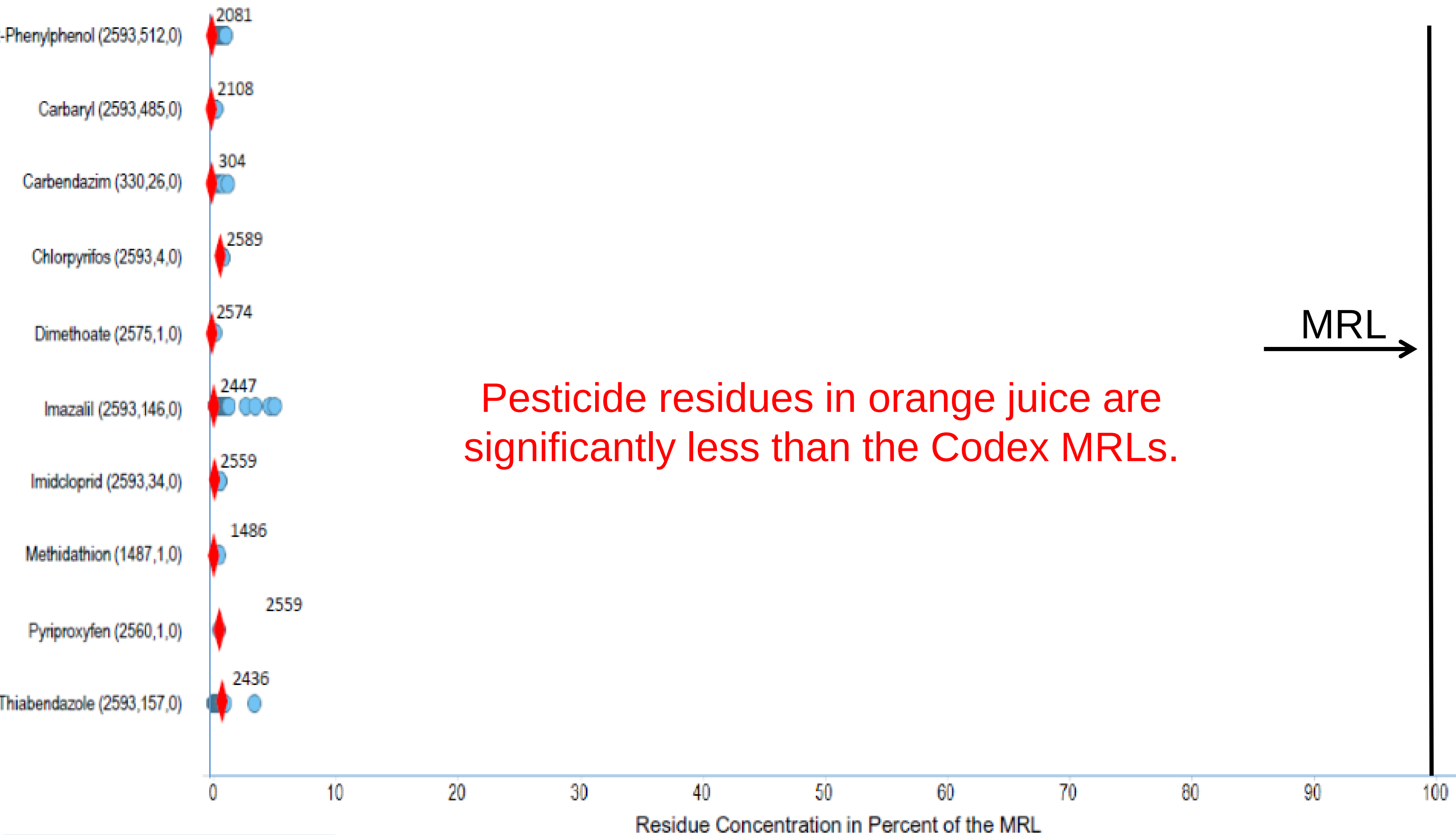

Pesticide (x,y,z)
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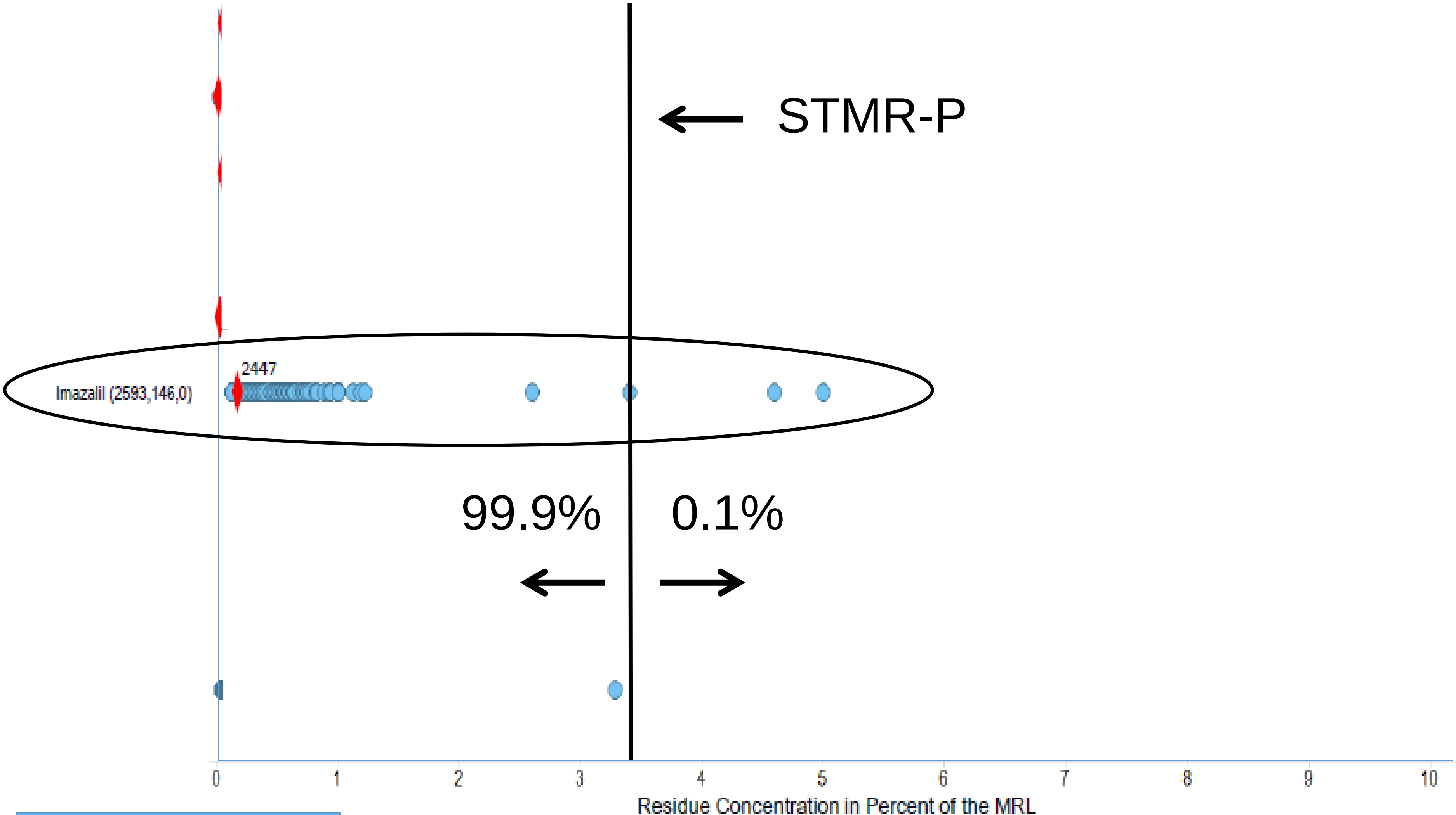

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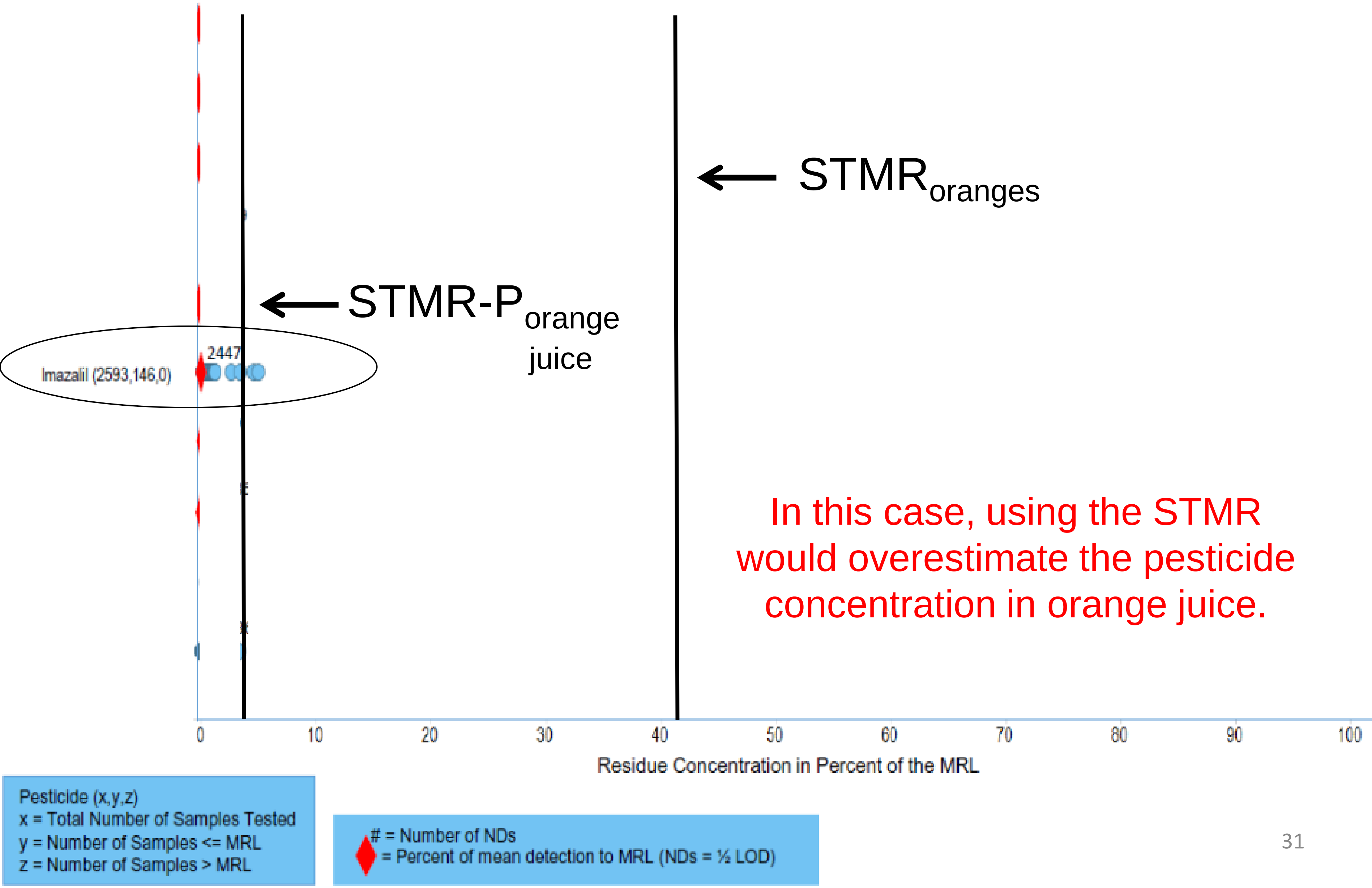
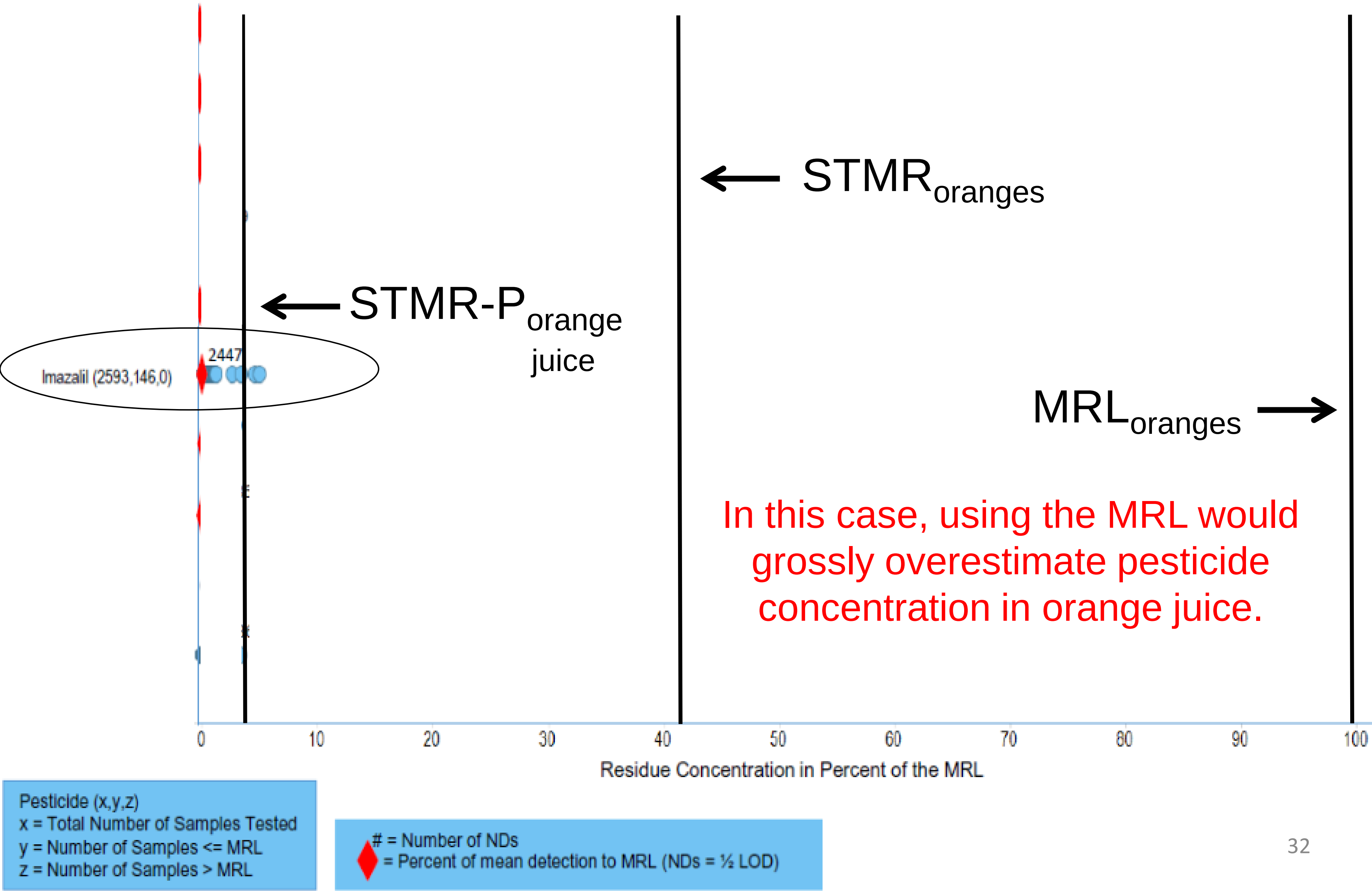


Orange Juice Residue Distribution Summaries with Comparison to CODEX Maximum Residue Level (MRL)



Illustrative example of bulking and blending in wheat and wheat flour, using real-world monitoring data

Bulking and Blending in Practice: **Wheat and Wheat Flour**

Farm → **Elevator** → **Processing**

Weighing, Grading, Cleaning, Blending, and Storage

Domestic Production

Harvest

Exports

Imports

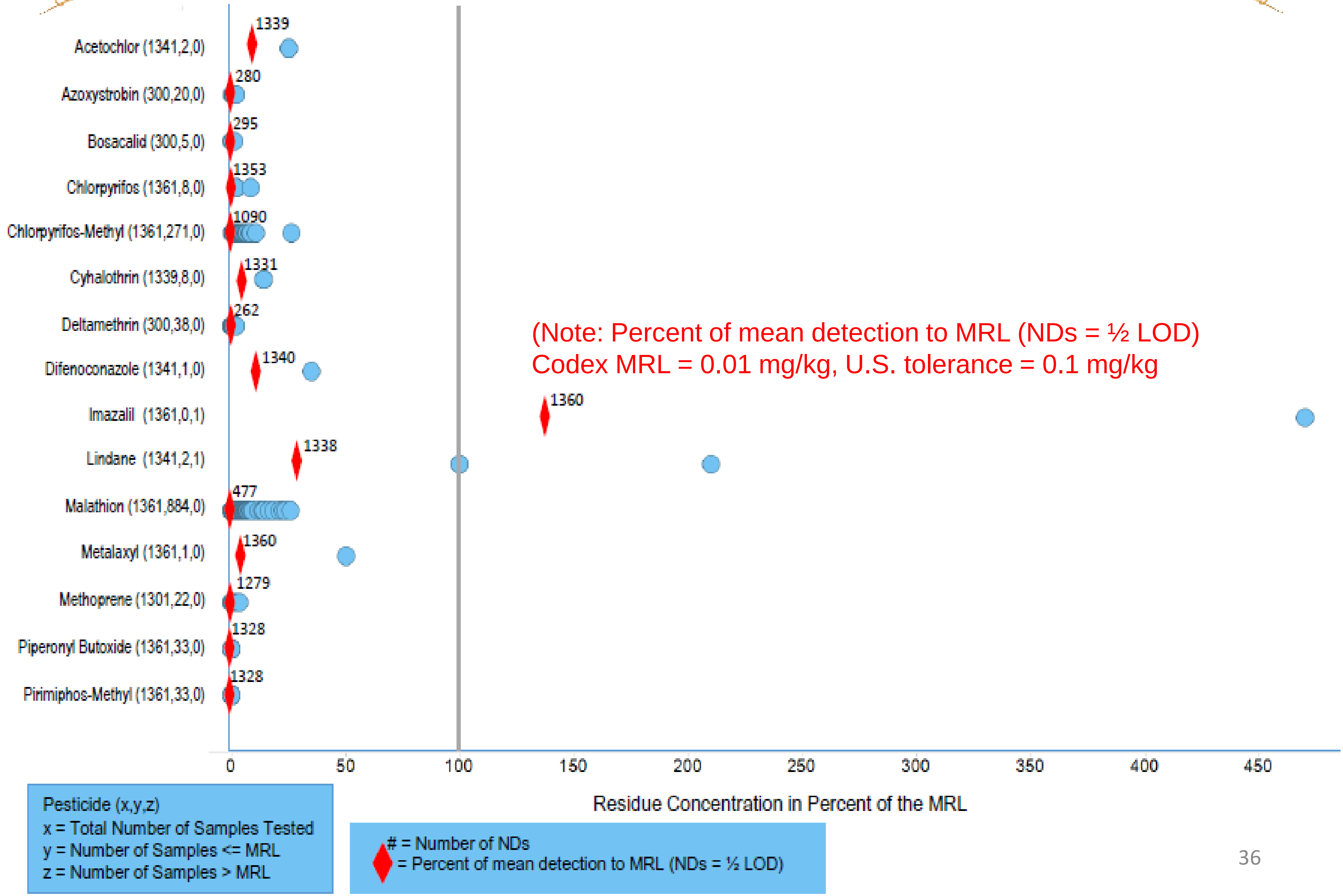
Milling

Animal Feed

USDA PDP Data for Wheat

- Wheat grain collected in 2005, 2006, 2012.
- 92 compounds were identified as having Codex MRLs established wheat/cereal grains.
- PDP tested for 35 of those 92 compounds in wheat.
- 15 of the 35 compounds had reported positive residue detections in wheat.

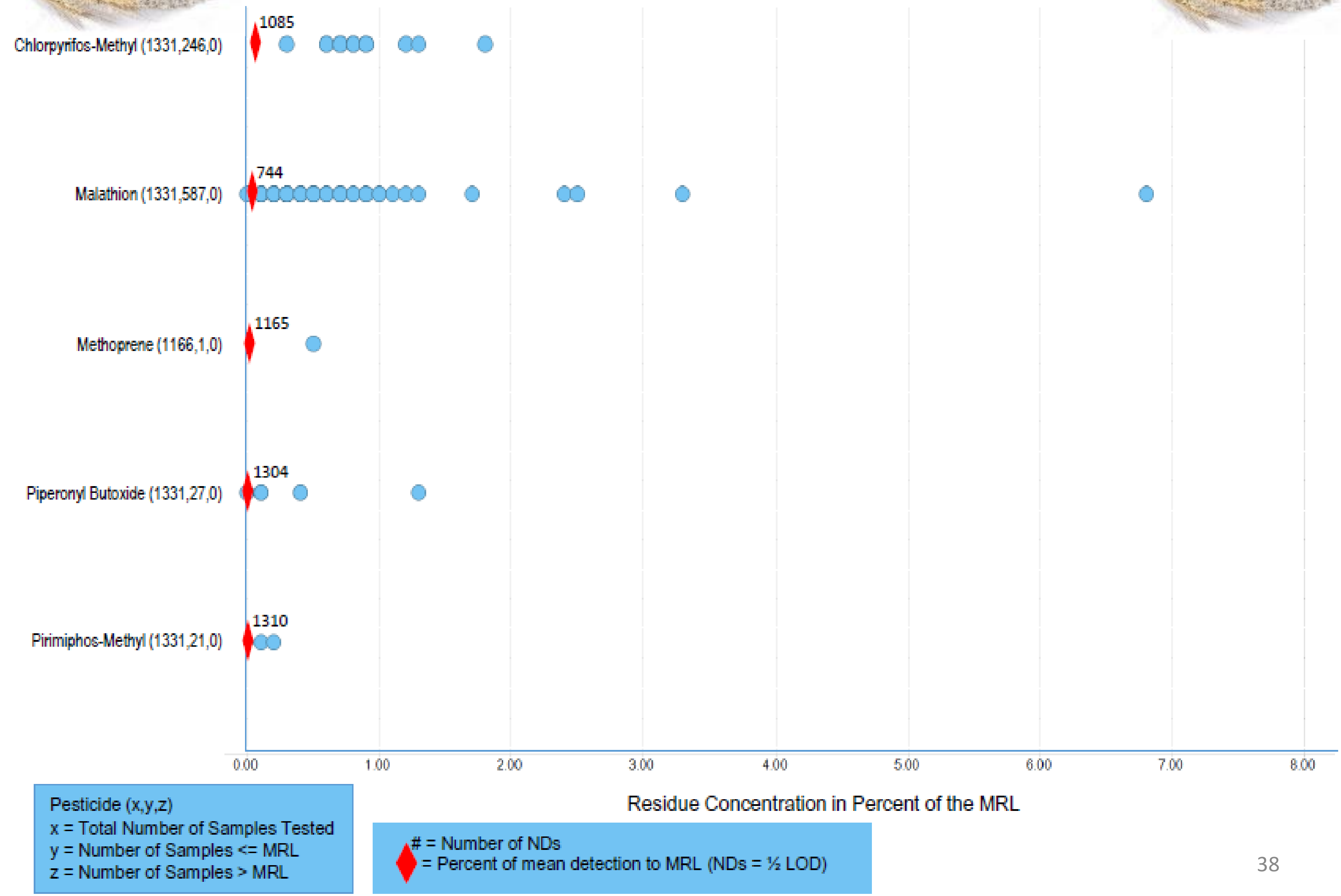
Wheat Residue Distribution Summaries with Comparison to CODEX Maximum Residue Level (MRL)



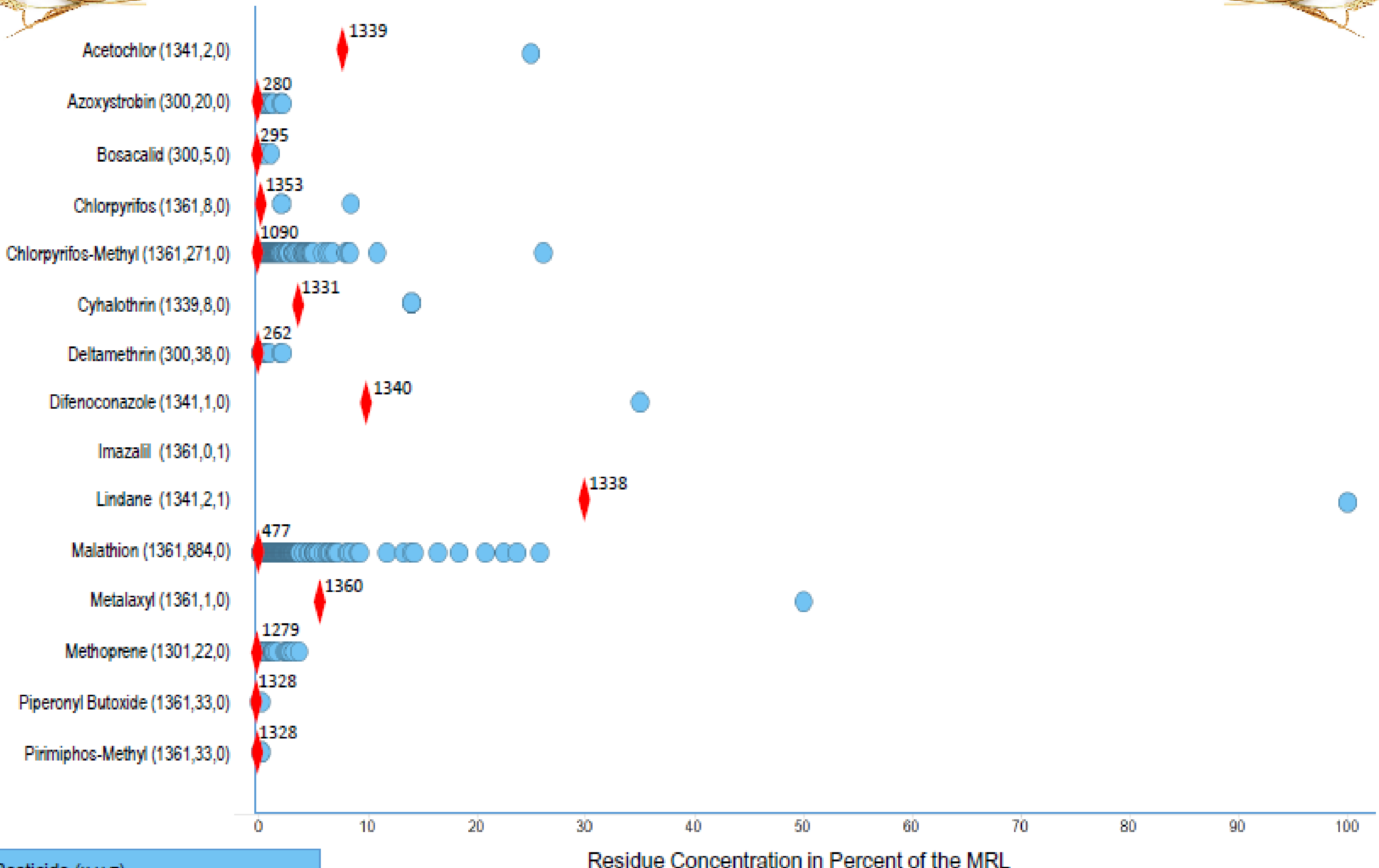
USDA PDP Data for Wheat Flour

- Wheat flour collected in 2003, 2004, 2005.
- 92 compounds were identified as having Codex MRLs established cereal grains.
- PDP tested for 24 of those 92 compounds in wheat flour.
- 5 of the 24 compounds had reported positive residue detections in wheat flour.
- No detections exceeded Codex MRL.

Wheat Flour Residue Distribution Summaries with Comparison to CODEX Maximum Residue Level (MRL)



Wheat Residue Distribution Summaries with Comparison to CODEX Maximum Residue Level (MRL)



Pesticide (x,y,z)
x = Total Number of Samples Tested
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= Number of NDs
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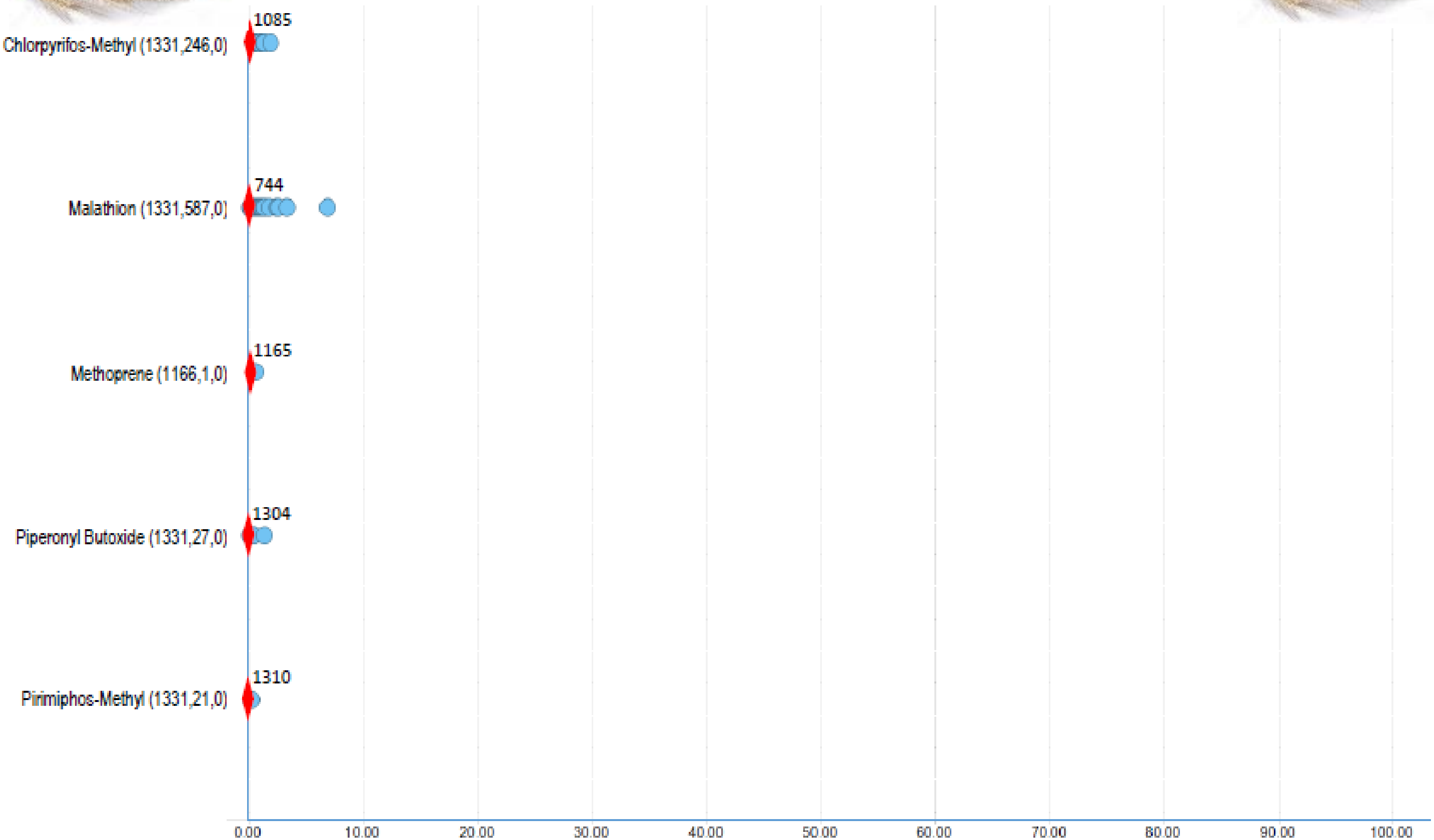
Wheat Flour Residue Distribution Summaries with Comparison to CODEX Maximum Residue Level (MRL)



Residue Concentration in Percent of the MRL

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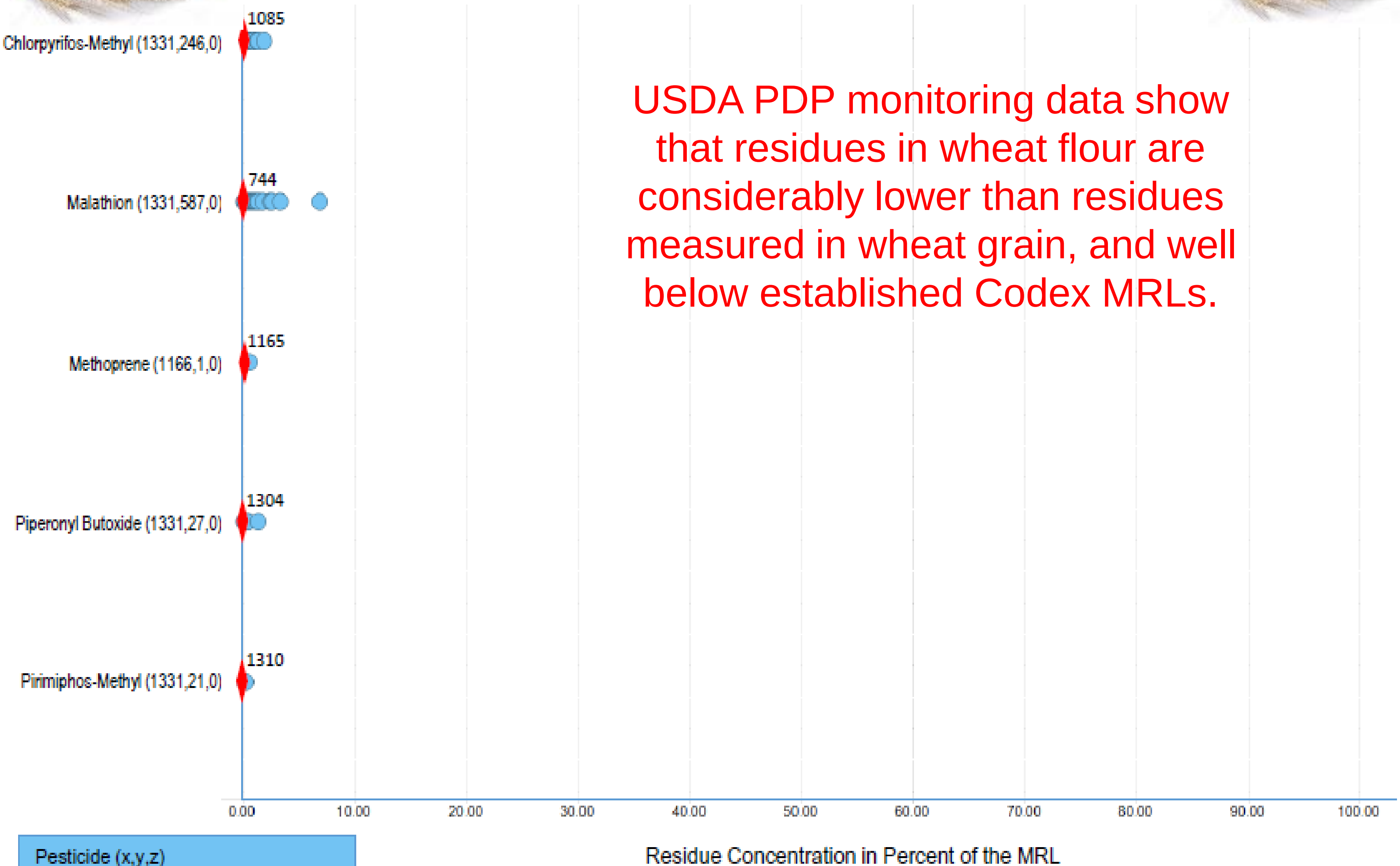

USDA PDP monitoring data show that residues in wheat flour are considerably lower than residues measured in wheat grain, and well below established Codex MRLs.

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Summary

IESTI Equations

Case 1

Unit Weight (U_{RAC}) < 25g

Example: Green Beans

Case 2a

Unit Weight (U_{RAC}) $\geq$ 25g

Edible Portion (U_e) < Large Portion

Example: Oranges

Case 2b

Unit Weight (U_{RAC}) $\geq$ 25g

Edible Portion (U_e) $\geq$ Large Portion

Example: Watermelon

Case 3

Bulked/Blended Commodity

Example: Orange Juice

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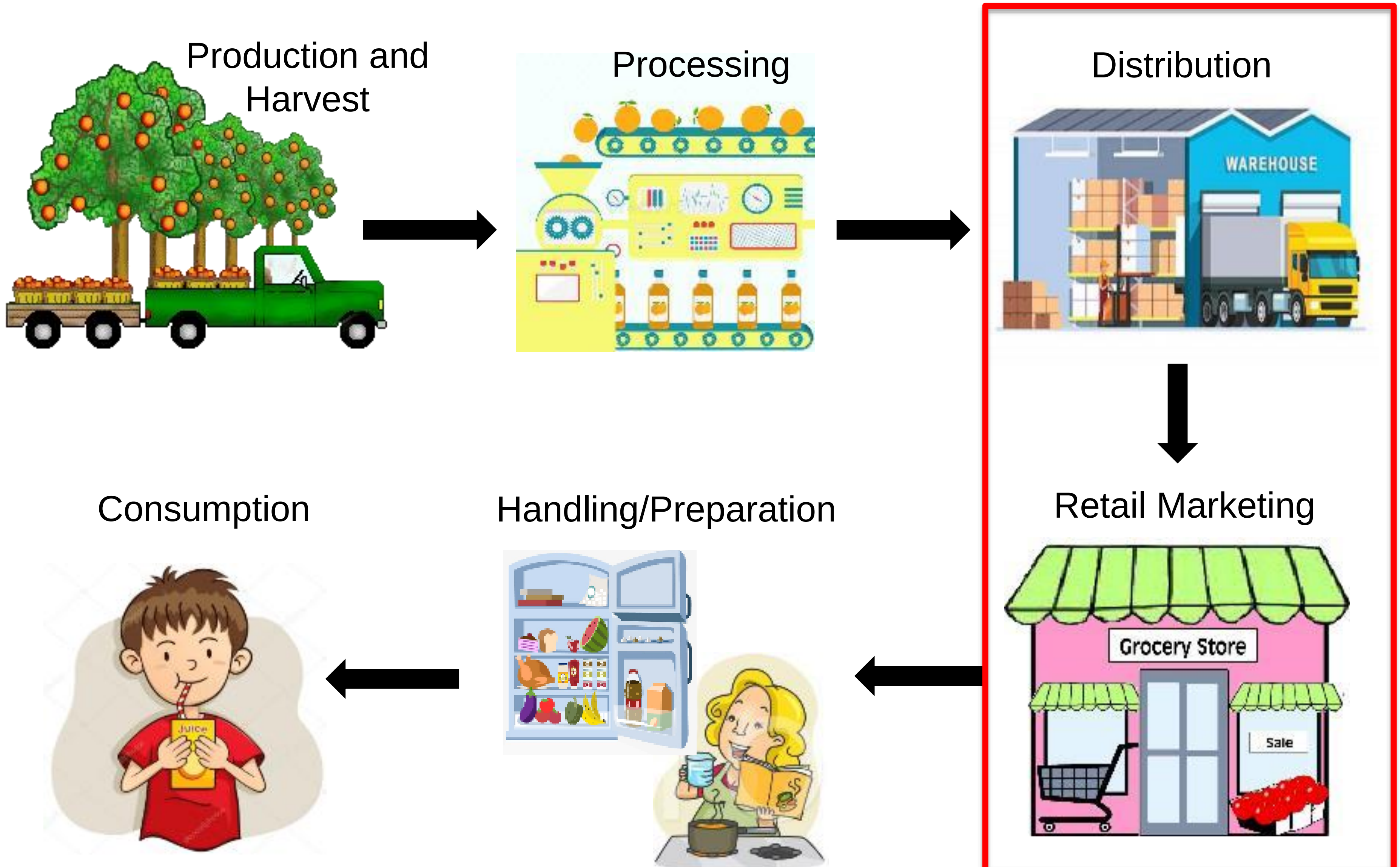

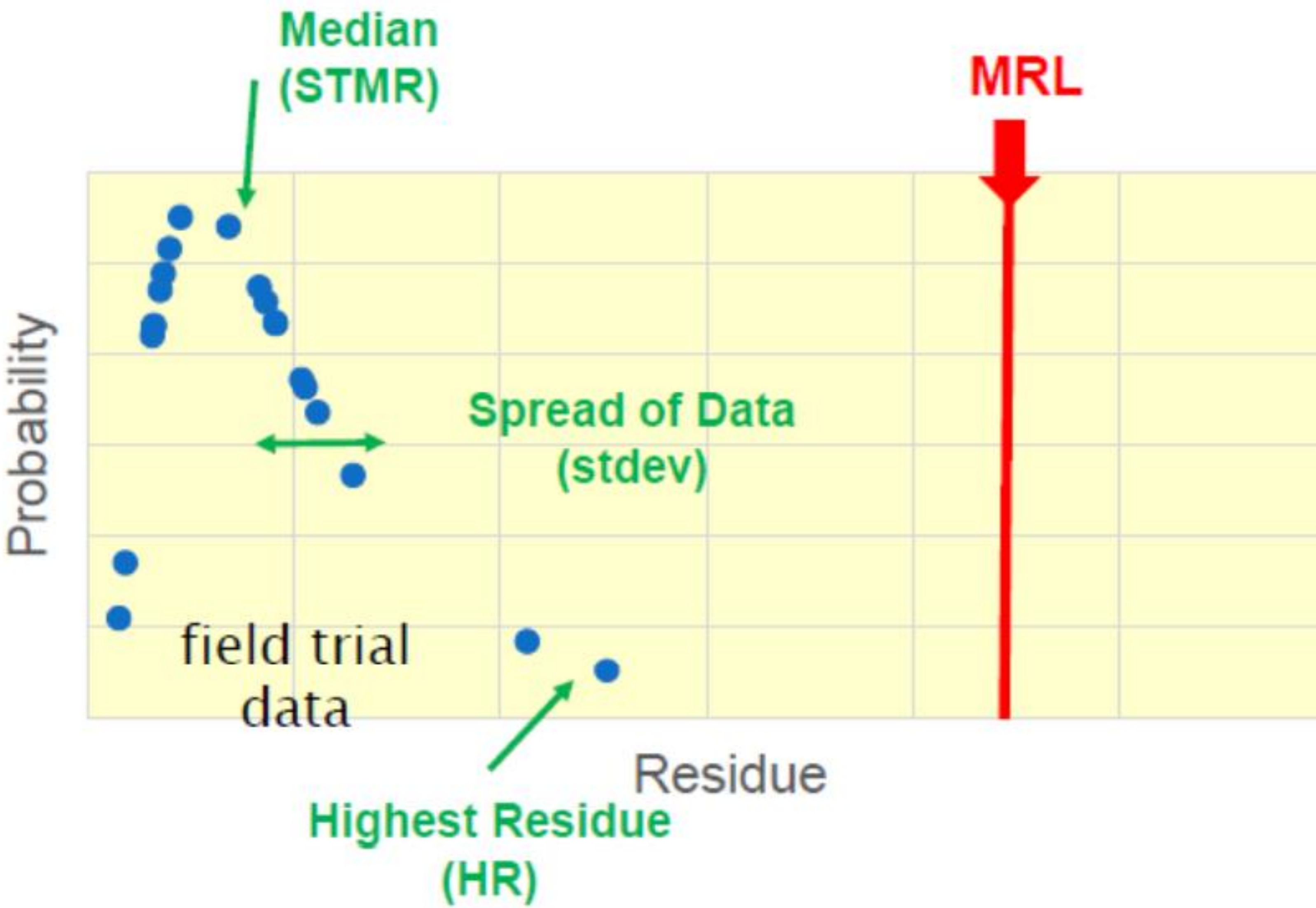
Median
(STMR)
MRL
Probability
Spread of Data
(stdev)
field trial
data
Residue
Highest Residue
(HR)

IESTI for Bulked or Blended Commodities

$$IESTI = \frac{(LP \times (STMR \times PF)}{bw}$$

$$IESTI = \frac{(LP \times STMR\text{-}P)}{bw}$$

Conclusions

- Bulking and blending will likely result in changes in the magnitude pesticide concentration.
  - The variability of pesticide residues will decrease during bulking and blending.

- The STMR-P appears to be an appropriate estimator of pesticide concentration in bulked and blended products.

- The changes in pesticide residues from pre-processing to post-processing indicate the direction and magnitude of the processing impact on pesticide concentrations.

- Finished product pesticide residue monitoring data may provide an excellent means to validate the pesticide concentration variables used in the IESTI equations.

- The USDA Pesticide Data Program is a potentially valuable resource for the IESTI process

Acknowledgements

Many thanks to Diana Haynes, Dawn Fey, and Roger Fry of USDA's Pesticide Data Program.

For more information visit:

https://www.ams.usda.gov/datasets/pdp

Much appreciation to my Ms. Julie Chao for intellectual and graphics support

Discussion

- Are there sources of processed product pesticide residue data other than USDA Pesticide Data Program?

- How can stakeholders support efforts to collect information on bulking and blending?

- Are there other data sources available for “real world information” that can be used to inform future work related to TOR iii?

- Are there other potential CCPR applications for processed product pesticide residue data?

Thank You
Muchas Gracias
Merci Beaucoup

For more information:
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