Analysis of performance between methods used during inter-laboratory studies in plant protection products

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INTRODUCTION

During 2018-2020, Proficiency Tests (PTs) were organized among laboratories all over Europe on plant protection products available on the Italian market. The aim of the inter-laboratory studies was to find out the quantity of active ingredients on the different formulation of the plant protection products. The paper describes, the results obtained in terms of z-score and the correlation between the analytical methods used by participants, in particular the correlation between CIPAC method, in house method and manufacturer's methods.

This activity planned in the framework of the collaboration with Italian Health Ministry and the National Institute of Health in Italy (ISS).

Due to the national monitoring programs are in compliance, with the European monitoring programs it is useful to enlarge the invitation to European Member State laboratories that work on this issues and also extra Europe laboratories from Argentina and Brasil.

During 2018-2020, different commercial products containing active ingredients like as Cymoxanil 20%, Methomyl 20% and Oxamyl 5%, Amisulbrom 5%, Dimethomorph 6%, Pirimiphos-Methyl 5%, Propiconazole 25%, Azoxystrobin 1,33%, Epoxiconazole 6,02%, Fludioxonil 3,32%, Metalaxyl-M 2,57%, Pyraclostrobin 8,17% and Thiabendazole 26,55%, shipped to the laboratories.

EXPERIMENTAL METHODS

The participant laboratory was free to use analytical methods applied in own laboratory and was asked to report the analytical information for each active substance.

The analytical methods largely used are:

1. CIPAC Method
2. In-house Method
3. Manufacturer's Method

STATISTICAL EVALUATION

The statistical evaluation of the results was performed applying the Jarque-Bera test for the verification of the hypothesis of normality. To use the Jarque-bera test is need to calculate asymmetry and curtosi check. These data were used to verify the acceptability in χ2 distribution at 95th percentage with the Jarque-Bera formula:

$$[(GdL^{(asymmetry;2)}/6)+(GdL1)^{(curtosi;2)}/(GdL+1)]$$

After this verification, the z-score values was calculated for each participant in each sample with the following formula:

$$Z_i = 0,6745 * (X_i - Median)/MAD$$

For each categories of methods, the media, median, variance and scatter chart were calculated.
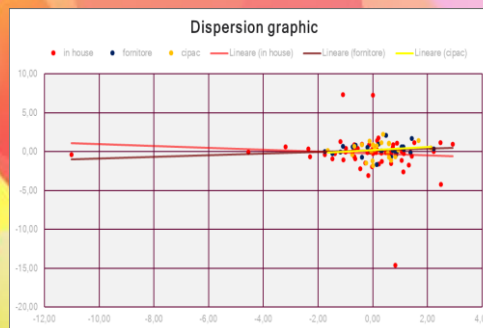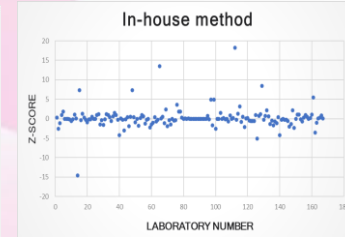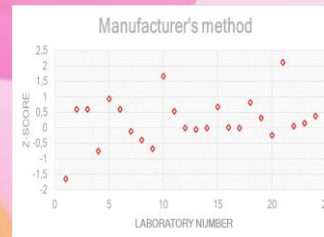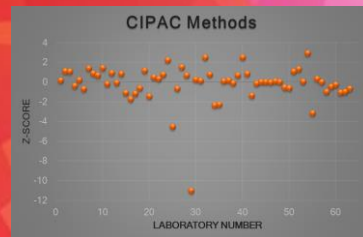
RESULTS

Based on the statistical evaluation, the results indicate that for each method, laboratories obtains acceptable results. In particular, laboratories that used

"CIPAC" method obtains a low dispersion index with a variance of 3,52 for 66 participants;

"In-House" method obtains a low dispersion index with a variance of 7,27 for 170 participants;

"manufacturer's" method obtains smaller dispersion index with the lowest variance of 0,56 for 27 participants.