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M E M O R A N D U M

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SUBJECT: DISLODGEABLE FOLIAR RESIDUE SAMPLING PATTERN

WH&S dislodgeable foliar residue (DFR) sampling activities are guided by HS-1600 (1). One of the "unknowns" has always been what type of sampling pattern to use as a Branch standard. The intent has always been to collect random, representative samples. Depending on the field size, layout, barriers such as supports and fencing, time constraints, etc., the pattern has varied. The "fathers of leaf punching", Gunther, et al., first addressed only tree sampling patterns, advising sampling of 8 trees at five equidistant points around the circumference per sample (2). In HS-970, the authors suggest sampling field crops along a single row (3). In a planned study, the sampling method has generally been described in the protocol.

Beginning in 1994, WH&S conducted DFR sampling as part of on-going residue survey studies. By 1997, staff collected nearly 1100 DFR samples, two random samples per field, along a V pattern as follows: beginning at one side of the field, cutting across to a center point diagonally (ideally near the far side of the field), turning and travelling back along a second diagonal, and exiting the field along the same side as entry. The V pattern was suited to most field configurations and was expedient since it allowed staff to end up on the same side of the field as they started. In 1997, several WH&S field staff took a 2-day class in Sampling Theory and Applications (4). The instructor stressed that representative DFR sampling in a field would best be achieved by adopting a "random, meandering" sampling pattern (S pattern) throughout the field. Collecting samples in a random S pattern is much more time-consuming. But, in the interest of science, staff decided to compare the sampling methods in the on-going residue study by taking one sample in each pattern, S and V, from each field.

This memo reports the results of statistical analyses conducted on the two sampling methods to evaluate whether the extra time spent collecting samples in an S pattern provides any value over the traditional V method. At the end of 2000, the database had 2194 total samples, 531 paired V samples (collected 1995 –1996) and 566 paired V vs. S samples (collected 1997 – 2000) (5). Residues reported as below the analytical limit of detection (LOD) were assigned a residue value of 0. Paired data sets (V1 vs. V2 residues for the 1995-1996 data; V vs. S residues for the 1997-2000 data) were then sorted and regressed (6). Each regression was then tested for slope = 1, since a value of 1 indicates a perfect correlation between paired residues. The sample residue (μg/sample) and regression statistics are shown in Table 1.

Table 1. Residue Statistics (µg) and Regression Analyses of Paired V Samples (1995 – 1997; n = 1062) and Paired S vs. V Samples (1997 – 2000; n = 1132)

| Sampling Pattern | Residue Statistics (µg/sample) Means | Standard Deviations |
|---|---|---|
| **Paired V Pattern** | | |
| V1 Residues (n=531) | 217.03 | 392.10 |
| V2 Residues (n=531) | 214.23 | 401.78 |
| **Paired S vs. V Pattern** | | |
| S Residues (n=566) | 212.97 | 528.20 |
| V Residues (n=566) | 215.39 | 531.62 |

Regression Analyses

| | V Pattern | V vs. S Pattern |
|---|---|---|
| **$R^2$** | 0.99 | 0.98 |
| **Estimated Intercept** (Coefficient $\pm$ Standard error) | -6.71 $\pm$ 2.25 | 0.66 $\pm$ 3.0 |
| **Slope** (Coefficient $\pm$ Standard error) | 1.02 $\pm$ 0.005 | 0.99 $\pm$ 0.005 |

Each regression was compared to tabled t values for distribution at $t_{0.95}$. The results show that, due to the large sample size, the slopes were found to differ significantly from 1. However, the $R^2$ values provide a good deal of confidence that the slopes (0.99 for the V pattern, 1.02 for the V vs. S pattern) are very close to 1, with no practical difference between the paired components for each sampling set. Given that pesticide residues might be expected to vary somewhat across a field, the similarity between the paired components of each sampling method is remarkable.

Statistics thus indicate that virtually identical results are obtained from either the V or S sampling patterns. However, collecting samples in a V pattern is more efficient and more adaptable to most field obstacles. Based on the above analyses, I propose that WH&S adopt the V sampling pattern as a generic default for collecting DFR samples, and that this default be incorporated in HS-1600 (1). Alternate patterns may be adopted by protocol for specific studies.

References

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