

## 2005 Project Report

**Title:** Calibration of granular variable-rate application equipment: volume versus mass measurement for pattern assessment

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**Objective:** To assess whether traditional volume measurements for calibration accurately depict the mass of applied granular material.

### Procedures:

The methodology for this study included selecting and using several common forms of granular fertilizers and agricultural lime. The granular products used were murate of potash, diammonium phosphate, triple super phosphate, urea, and agricultural lime. Samples were used from two different sources: 1) bagged form (roughly 50 lb quantities) and from stockpiles located at a local fertilizer distributor. A calibration kit was obtained which used plastics test tubes (volumetric measurements) placed in a holding tray which is common to most kits used when calibrating granular applicators; both spinner spreaders and pneumatic applicators. Each test tube had predefined gradient marks. For each granular product, tubes were filled to 0.5, 1.0, 1.5, 2, 4, 6, 10, 15, 30, and 45 mL levels. The material in each tube was then placed a digital scales to measure its mass. Three replications were conducted for each product. A student hired during 2005 picked up all materials, conducted the experiment, and provided preliminary analyses.

### Results:

Data was analyzed by comparing the volumetric measurements to the mass measurements for each granular product. Results are summarized in table 1 and indicated the following:

1. Volume measurements using plastic test tubes provided in traditional calibration kits can produce highly variable results leading to potential distribution issues even after calibration.
2. Difference for Agricultural Lime and Potash were the lowest indicating that volume calibration is somewhat indicative of expected distribution from a granular applicator.
3. Using volume measurements as a basis for calibration for phosphate, triple super phosphate, and urea is a concern. In a majority of the comparisons for these products, variability was in the 30% to 40% range.
4. It is recommended that mass measurements be used in place of volume measurements when possible to better represent distribution patterns from granular applicators especially those equipped with variable-rate technology (VRT) since rate changes will be occurring under field operation.

- a. Using mass measurements is not a convenient procedure to use when calibrating applicators. More than likely, it will take longer to perform mass measurements than using the traditional volumetric procedure.
- b. If future results continue to support these findings, then a new, quick and easy method for weighing material will need to be developed to minimize calibration time.

Future plans include continuing this investigation by testing additional granular products and presenting results to the Potash and Phosphate Institute.

**Table 1. Summary of results for the various granular materials tested.**

<b>Product</b>	<b>Average Difference</b>
Agr. Lime	13%
Potash	8%
Phosphate	17%
Triple Super Phosphate	22%
Urea	35%