A method for determining the location of wheat seeds after sowing and its application to the evaluation of seeding equipment

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Many farmers have reported poor emergence of their wheat crops following the sowing of semi-dwarf cultivars, especially when soft seed beds and wide-line and air-seeder type combines are involved.(1) We hypothesised that the seed was sown too deeply.

Samples of wheat were coated with a fine film of lead oxide, using methyl cellulose as a glue, and then poured down the boot of an operating combine. Sections of the seedbed 25cm long, 10cm deep and 10cm wide were then enclosed in a galvanised iron container, similar to an oversized matchbox, and removed. These samples were examined from above and the side using a standard X-ray diffraction machine (as used in a veterinary clinic), and allowed to germinate in a warm glasshouse. (This X-ray technique was suggested by Baker.(2))

The lead oxide coating had no deleterious effect on germination (800 seeds treated gave 96% germination, equal to the control) and allowed 85% of all seeds planted to be located in the seedbed samples without disturbing them. Barium oxide, another X-ray opaque compound, was also tested, but it was not possible to coat the seeds effectively.

The seed was not planted through the seed metering unit of the combines. as to do so required too much seed, damaged the seed coating and gave a sowing rate which was too low for reasonable estimates of the effectiveness of the sowing equipment. Three different types of cereal seeding combine were used to test the technique and to evaluate the machines themselves. The combines were a 72 run, 10 metre wide air seeder (4 tines, spaced across the machine, a well prepared seedbed). a 21 run trash-culti-drill (1 tine, new vs worn feet. cultivated vs direct seeded sites), and an 11 run, 3.3 metre combine with each tine equipped with a coulter and held almost rigid (four different points on four different tines were compared). In the case of the air seeder, the emergence for different tines ranged from 75.2% to 34.8%. The mean seed depth was 6.25cm and 9.47cm for these two tines; the wheat cultivar was 'Kite'. Over all situations examined, there was a high negative correlation between sowing depth and germination %, especially for seeds planted below 5cm.

As the warm glasshouse was an ideal environment for germination, field differences would probably be more pronounced.

Of particular significance in the light of this correlation was the measurement of substantial differences between the types of tines and widths of machines in their ability to sow seeds accurately. In summary, the narrower the point used on the tine, the more rigid the tine, the narrower the combine, and the harder the seedbed being traversed by the tractor and combine, the better the level of control gained over seed placement. The worst situation was a wide machine following a tractor which left wide and deep tracks in the soft seedbed.

1. It is suggested that semi-dwarf wheat cultivars are frequently sown too deep as many combines are incapable of achieving the result required across the full width of the machine. This is especially so on soft seedbeds.

2. T. Hutchings, Wagga Wagga; P. Sparshott, Dubbo; W. Hodges, Moree, N.S.W. Pers. comm.

3. J. Baker. Agricultural Mechanisation Section, Massey University, N.Z. Pers. comm.