SUMMARY

DETERMINANTS OF SUNFLOWER SEED QUALITY FOR PROCESSING

1. The low and varying protein as well as high crude fibre contents of oil cake produced from sunflower seed create problems for the South African sunflower oil expelling industry. This prompted research on factors that may affect the seed quality for processing purposes. The seed quality characteristics are the seed oil and protein contents and the hullability. Analysis of the kernel-rich fraction produced after dehulling and separation of the hulls gives an indication of the potential oil yield, oil cake yield and oil cake protein and crude fibre contents of the seed, and thus the processed value.

2. The effect of seed moisture content, while drying naturally, on the hullability of seed samples was investigated. Drier seed needed a lower huller speed for optimum dehulling. Hullability increased as seed moisture content declined. Simultaneously the amount of fine material, and associated loss of oil and protein, increased. Sifting seed into size classes had limited success, as the potential oil yield of only two of the four samples was increased by 9%, while for one sample it was reduced. Due to differences in hullability of the seed size classes, different oil cakes with different protein contents resulted.

3. In a number of field trials, the effects on the yield and seed quality characteristics of cultivar, environment and selected environmental variables, namely plant population, nitrogen and boron fertilisation and water stress during grain-filling, were studied. Seed yield and quality were more affected by environment than by cultivar. Cultivars differed in their stability for characteristics such as hullability over environments. Seed size and hullability, and as a result also the protein content of the potential oil cake, were affected by plant population, with lower populations favouring quality. Increased nitrogen application improved seed yield and seed protein content but lowered seed oil content, with no effect on hullability. Consequently the amount of recoverable oil declined, the potential oil cake yield increased, and the protein and crude fibre contents of the expected oil cake increased and decreased respectively. Seed yield increased in one trial but declined in a second due to boron fertilisation, whilst the seed

composition was unaffected. Hullability was also reduced at one locality due to boron fertilisation, leading to changes in oil cake yield and quality. A mild water stress during the grain-filling stage reduced seed yield by 23% and hullability by 14%.

4. Due to the need for a seed grading system based on seed quality, multiple linear regression analyses between easily measurable seed characteristics and seed quality parameters were done on seed samples representing 19 cultivars grown at 11 localities. The relatively low mean absolute errors between the measured and estimated values indicate that seed oil content, protein content and hullability might be estimated with reasonable accuracy. These relationships must still be validated, however.

5. An analyses of the combined data of all the field trials, revealed that optimising the seed oil:seed protein ratio through breeding may be the most advisable option for improving seed quality for processing.