**Effect of reduced seed set and seed position on the oil content and mineral composition of sunflower seeds**

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Many sunflower cultivars have poor seed fill near the centre of the head. Vascular connections supplying the centre of the head with nutrients are often developed poorly (Milburn, pers. comm.); further, the vascular flux of nutrients moves radially to seeds in the outer zone of the head, and then back towards inner seeds. It is possible that growth of central seeds of the head is restricted by lack of nutrients. Our work aims at determining if nutrient deprivation is a primary cause of poor growth of these seeds.

We report some preliminary results.

**Methods**

A cytoplasmic male sterile line, Sirosun 89A, was grown in the field under irrigation. Pollination of heads was prevented by clipping stigmas and bagging to give the following zones of seed development; outer 1/3, middle 1/3, inner 1/3, outer 1/2, outer 2/3, full head (control), full head with 4/5 florets removed, full head not fertilized so only hulls developed, and head with

4/5 hulls removed. Leaves were sampled at flowering and seed maturity.

**Results and Discussion**

Oil as a 1 of seed dry weight was highest for heads with most seeds, and when multiplied by single seed weight, the amount of oil per seed was similar for most treatments (Table). Irrespective of position on the head, seeds were largest and had the highest concentrations of N (Table), P, K and Mg (not shown) when heads had the fewest seeds. The low 1 oil in seeds from heads with reduced seed number was probably due to their greater protein content as a result of the higher % N (Table). The magnitude of seed demand for N had only a small effect on N redistribution from leaves, but had a large effect on levels of N (Table), P, K and Mg (not shown) in the mature capitulum or in unfilled seeds (flats).

**TABLE Response of seed characters to seed number and position on head.**

| Treatment | No. seeds /head | mg d.wt /seed | % oil /seed | mg oil /seed | Concn N (mg/g d.wt.) in: lvs | head | flats | kernel |
|---|---|---|---|---|---|---|---|---|
| inner 1/3 | 241 | 65.6 | 35.1 | 23.0 | 2.3 | 35.0 | 35.7 | 49.9 |
| 1/5 seeds | 361 | 62.7 | 39.0 | 24.5 | 2.1 | 29.3 | 35.8 | 47.7 |
| middle 1/3 | 519 | 57.2 | 37.6 | 25.1 | 2.1 | 29.9 | 30.4 | 46.6 |
| outer 1/3 | 620 | 62.1 | 42.0 | 26.1 | 2.2 | 24.4 | 30.5 | 44.8 |
| outer 1/2 | 918 | 45.6 | 43.4 | 19.8 | 2.3 | 20.6 | 27.1 | 44.1 |
| outer 2/3 | 1207 | 48.6 | 45.8 | 22.3 | 1.9 | 19.3 | 28.9 | 40.9 |
| full seeds | 1771 | 50.6 | 45.9 | 23.2 | 2.0 | 18.3 | 25.9 | 42.2 |
| full flats | - | - | - | - | 2.3 | 36.1 | 36.3 | - |
| 1/5 flats | - | - | - | - | 2.3 | 38.2 | 34.6 | - |
| LSD (0.05) | 183 | 10.8 | 3.9 | 2.5 | 0.2 | 3.3 | 3.6 | 2.7 |

The results suggest for Sirosun 89A that: (a) a large total seed sink is necessary for the highest % oil per seed. (b) inadequate supply of assimilates to the head is not likely to be the cause of poor seed filling, because of the constant mg oil per seed. (c) the vasculature of the capitulum is just as capable of supplying assimilates and minerals to central as to outer seeds. (d) lack of N, Y, K and Mg per se is not likely to restrict seed development as these nutrients remain unused in the head if seed demand is reduced.

We conclude that poor seed fill in the centre of the head is due to outer seeds controlling the growth of inner seeds, probably via growth regulators or competition for space.