**Using canola monitoring groups to understand factors affecting canola production in Esperance**

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**Abstract**

Canola monitoring groups were used to gather information so that production across a range of soils, climatic conditions and management strategies could be examined to identify what factors were limiting production. Soil and leaf samples and all inputs were recorded from each paddock monitored. Results showed that it was difficult to draw conclusions when single factors were compared to seed yield, possibly due to the complex interaction that occurs between factors. Factors that appeared to have no linear relationship to seed yield were time of sowing, nitrogen fertiliser applied and plant leaf nitrogen levels. By selecting high yielding and low yielding paddocks possible yield limiting factors could be identified for individual paddocks.

**Key words**

Canola, yield, limiting factors.

**Introduction**

Esperance is located 750km south east of Perth, Western Australia. The climate is Mediterranean with an annual rainfall of 600mm. The area of canola has increased dramatically over the past three years from 10000 to 75000ha, resulting in most growers being new to canola production. To assist in gathering information about canola production, grower groups were formed where growers were encouraged to select one paddock and to monitor all inputs in that paddock. Information recorded was time of sowing, variety, plant population, all inputs (fertiliser, weed control, insect control), rainfall, time of swathing, time of harvest and seed yield and oil content. A soil sample was collected just after sowing in 1999 and leaf samples collected 74 days after sowing in 1998 and 1999.

**Results and discussion**

It is widely understood that there are a number of factors limiting yield. Lack of moisture is usually the most limiting with low fertility, poor plant population, poor soil structure, improper crop variety, weeds, insects and diseases all limiting the final possible yield. By undertaking paddock trials each factor can be investigated and a best management strategy developed. This is done by eliminating all other factors and trialing various rates of the factor under investigation. For example if a variety is sown at different times where all the other factors are kept constant (nutrition, weed control, insect control etc), then the optimal sowing time for that season can be determined as shown in Table 1.

**Table 1. Determining optimal sowing date for different varieties – 1998.**

| Variety | Seed Yield at Time of sowing (t/ha) | | | |
|---|---|---|---|---|
| | 30 April | 21 May | 11 June | 2 July |
| Pinnacle | 3.4* | 3.3 | 2.7 | 1.7 |
| Clancy | 3.3* | 3.1 | 2.2 | 1.7 |

| | | | | |
|---|---|---|---|---|
| Karoo | 3.0 | 3.1* | 2.7 | 1.8 |

* Optimum sowing time for this season

When the data from the monitoring groups was analysed by selecting each factor and comparing to seed yield, no meaningful relationship could be obtained between that single factor and seed yield. Figure 1 shows the effect of time of sowing on yield. The data shows a random scatter pattern with no significant relationship with yield. The same results occurred with comparisons of total nitrogen fertiliser applied and leaf nitrogen content on seed yield. This scatter of data indicates that there is often no linear relationship between single factors and yield under paddock conditions. This is because the other factors are not eliminated allowing for interaction between the factors which muffles the results and prevents linear comparison of individual factors. This raises the question as to whether monitoring groups' data can be useful in understanding what is limiting production? If the data cannot assist growers in improving their production then there is no reason to continue in collecting data in monitoring groups.

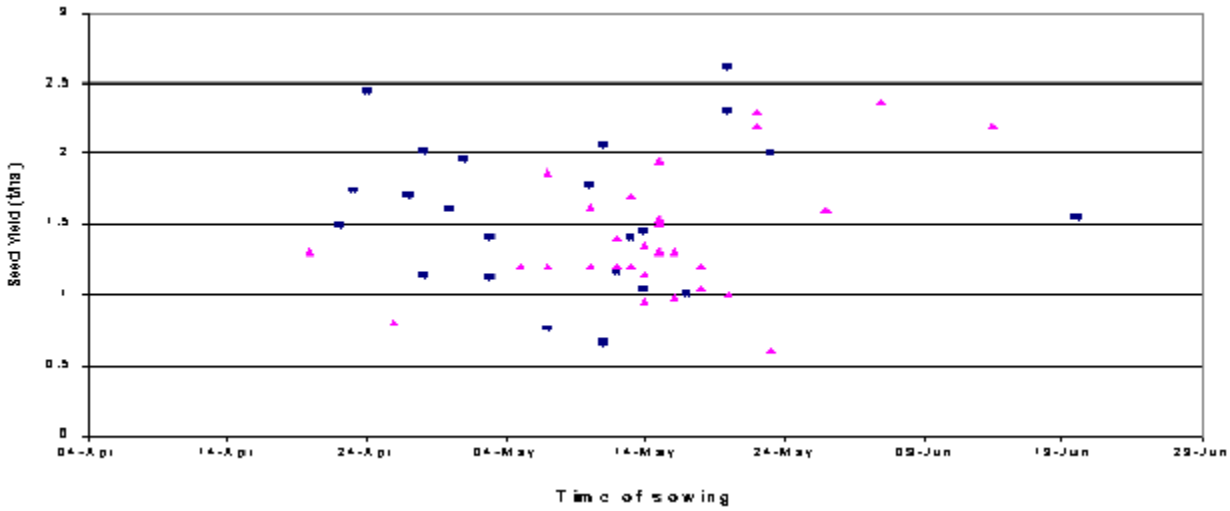


**Figure 1. Effect of time of sowing on seed yield (1998 (■) and 1999(▲)).**

To try and understand why some paddocks performed well and others not, paddocks were selected and compared with each other to see what where the possible factors responsible for the difference in yield. High yielding paddocks were selected and compared to low yielding paddocks to try and explain the difference in yield.

**Table 2. Selected grower information collected to compare high yielding with low yielding paddocks for 1998 and 1999.**

| Paddock | Variety | Sowing Date | Seed Rate kg/ha | Crop Density plants $m^{-2}$ | Row width (cm) | Swath date | Harvest date | Grain Yield t/ha | Oil % | Gross Margin $ | Rooting Depth (cm) | Total Input Cost $ | Previous Crop | Rain Mm Apr - Oct |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1998 – Sandplain | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C | Karoo | 7/5 | 5.0 | 90 | 26.0 | 5/11 | 20/11 | 0.75 | 42 | -76 | 10-15 | 331 | Pasture | 431 |
| D | Pinnacle | 3/5 | 5.0 | 45 | 17.8 | 3/11 | 22/11 | 1.40 | 44 | 231 | 20-30 | 262 | Barley | - |
| **E** | Pinnacle | **20/5** | **5.0** | **60** | **16.0** | **7/11** | **24/11** | **2.60** | **42.** | **558** | **20-30** | **333** | **Pasture** | **312** |

1999 – Mallee (duplex)

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| F | Karoo | 14/5 | 5.0 | 70 | 25.4 | 14/10 | 2/11 | 0.95 | 40 | 55 | 10-15 | 221 | Wheat | 222 |
| **G** | Pinnacle | **20/4** | **5.0** | **55** | **25.4** | **15/10** | **10/11** | **1.30** | **44** | **122** | **15-20** | **279** | **Barley** | **222** |

**1998 – Sandplain**

Table 1 shows the data from two low yielding paddocks (paddock C and D) and one high yielding paddock (paddock E). The possible reasons for the lower yields of paddock C were: (a) Karoo was sown in Paddock C, compared to Pinnacle in paddock E. Local trials have shown that Pinnacle is more suited to the longer growing season of the Sandplain and has yielded 12% higher than Karoo on average over two years trials; and (b) hail damage - paddock C experienced a thunderstorm that caused hail damage during flowering and resulted in the soil remaining waterlogged for two weeks.

The soil and leaf samples showed that paddock C had adequate soil fertility but the yield was limited by variety, hail and waterlogging. Paddock D and E were on similar soil types. They had the same variety, with paddock E being sown 17 days later. Weed and insect control was good for both paddocks. Similar nitrogen and phosphorus fertiliser were applied to paddock D and E. Leaf samples showed that all nutrients except potassium were similar for both paddocks. Paddock D had marginal potassium levels. Paddock D was sown after a barley crop while paddock E was sown after a pasture.

The possible reasons why paddock D yielded 46% lower than paddock E are: (a) the lower potassium level in the soil resulted in a deficiency; (b) lower soil nitrogen (barley versus pasture previous crop) resulting in a deficiency during pod development; (c) possible lower rainfall (no rainfall records were available for this paddock); and (d) possible higher harvest losses.

**1999 Mallee**

Although paddock G and F had the same rainfall there was a 26% difference in seed yield. Both were on duplex soils, although paddock G had a slightly better rooting depth. The reasons why paddock G possibly outyielded paddock F could be due to: (a) variety - local variety trials have shown that Pinnacle sown early will outyield Karoo sown later at the same site; (b) rooting depth - paddock G had a slightly better rooting depth, allowing for better utilisation of rainfall. Paddock G also had a sandier topsoil, which could have allowed better infiltration and utilisation of rainfall; (c) the leaf analysis showed that paddock F had marginal copper levels, indicating that copper could have been a limiting nutrient; and (d) rainfall

distribution - paddock G had slightly higher rainfall in August and September, during pod fill, which could have contributed to the higher seed yield.

**Table 3. Average paddock results for esperance canola monitoring groups 1998.**

| Group | Sowing Date | Seeding Rate kg/ha | Crop Density plants/m? | Row width (cm) | Swath date | Harvest date | Grain Yield t/ha | Oil% | Gross Margin $ | Rainfall (mm) Apr-Oct |
|---|---|---|---|---|---|---|---|---|---|---|
| Scaddan | 10-May | 4.4 | 51 | 23.3 | 20-Oct | 10-Nov | 1.24 | 41.8 | 162.24 | 340 |
| Dalyup | 13-May | 4.8 | 105 | 22.2 | 3-Nov | 28-Nov | 1.13 | 43.7 | 124.62 | 458 |
| Munglinup | 29-Apr | 4.7 | 59 | 22.4 | 21-Oct | 12-Nov | 1.72 | 43.3 | 366.27 | 350 |
| Condingup | 25-May | 6.1 | 70 | 19.1 | 11-Nov | 30-Nov | 1.86 | 42.0 | 343.94 | 355 |
| AVERAGE | **11-May** | **5.0** | **71** | **21.7** | **29-Oct** | **20-Nov** | **1.48** | **42.7** | **249.26** | **375** |

## CONCLUSION

When all the data is collected and averaged it provides useful comparisons for growers to compare their paddocks with the group average (Table 3). These averages can be used as benchmarks that will guide new growers when deciding on inputs and budgeting. By comparing single factors with seed yield no meaningful relationship occurs. When the best paddocks are compared to the poorer performing paddocks the possible yield limiting factors can be identified and growers can learn from the data. An important issue was that growers could visit other growers' paddocks and discuss management practices. A lot of information is exchanged at these informal meetings. There are still some paddocks that are difficult to explain the reason for the poor yield results. This could be due to other factors that were not recorded which could have an effect on final seed yield. There are also complex interactions that are difficult to measure under paddock monitoring. The results showed that caution is required when interpreting monitoring groups' information. Growers found the monitoring groups very useful with the information and experience gained enabling growers to improve their canola production.