The Effect of Seeding Date, Seeding Rate, and Applied Nitrogen on the Yield of Canaryseed

W.E. May[1], Y. Gan[2], and G. L. Lafond[3]

[1]Indian Head Research Farm, AAFC and IHARF, P.O. Box 760, Indian Head, SK
[2]Semiarid Prairie Agricultural Research Centre, AAFC, P.O. Box 1030, Swift Current, SK [3]Indian Head Research Farm, AAFC, P.O. Box 760, Indian Head, SK

A Joint Project between
Agriculture Agri-Food Canada and the **Indian Head Agricultural Research Foundation**

Executive Summary

A major problem when growing canaryseed is the year to year fluctuation in yield experienced by Saskatchewan farmers. The cause of this fluctuation in yield is not known, but suggestions include seeding rate, seeding date , nitrogen rate, potassium, sulfur, aphids, a fungus called leaf mottle, and lack of moisture during grain filling. To determine the cause of this fluctuation in yield and to optimize the agronomics of canaryseed production research examining the effect of planting date, seeding rate and nitrogen rate at three locations, Melfort, Indian Head and north of Swift Current (Stewart Valley) was started in 1999. In 2000, with additional funding from the Potash and Phosphate Institute of Canada, and Agriculture and Agri-Food Canada work was started on potassium and sulfur.

Two full seasons have been completed. In 1999 all four experiments were conducted at the three locations. No major problems occurred at Indian Head or Swift Current during the growing season. In addition the seeding rate and nitrogen rate experiments were conducted at Weyburn. At Melfort, in 1999 hail damaged the plots in July reducing yield and the reliability of the data. At Weyburn, bird damage and drought at the end of the season reduced yields. In 2000, the Septoria leaf Mottle experiments were lost at Indian Head due to flooding and also at Weyburn because of excessive wild oat pressure.

Seeding date had a large effect on yield at several locations. The first seeding date had the highest yield at Swift Current and Melfort while the second seeding date was highest at Indian Head in 1999 and in a preliminary experiment conducted in 1998. In 2000, the first seeding date had the highest yield at Indian Head and Melfort. While seeding date did not affect yield at Swift Current or Saskatoon.

The yield of canaryseed did not readily respond to changes in seeding rates. Slight increases in yield occurred at Melfort and Weyburn in 1999 and 2000 as the seeding was increased. In addition canaryseed yield did not respond to increasing rates of nitrogen fertilizer. Controlling Septoria leaf mottle with Tilt did provided a yield response 4 out of 6 site years. The two sites where a response did not occur was at Stewart Valley. The Canaryseed yield was significantly increased by potassium at two locations but the results are two preliminary to make general conclusions.

Introduction

Between 1992 and 1997, the acres of canaryseed in Saskatchewan have fluctuated between 233,000 and 580,000 acres and the farm gate sales have fluctuated between $18 and $88 million . At present, the major areas of production in Saskatchewan are the Regina plains, Kindersley-Elrose and Melfort. In a survey of canaryseed growers on the Regina plains the biggest problem was the year to year variability in seed yield. The cause of this fluctuation in yield is not known, but suggestions include seeding rate, seeding date, nitrogen rate, sulfur, aphids, a fungus called leaf mottle, and lack of moisture during grain filling. To determine the cause of this fluctuation in yield and to optimize the agronomics of canaryseed production, research examining the effect of seeding date, seeding rate, nitrogen rate and Septoria leaf mottle was initiated at two locations, in 1998, Indian Head and Weyburn. With additional funding from Saskatchewan Agriculture and Food's Agricultural Development Fund, research was expanded to four locations in 1999, Indian Head, Weyburn, Melfort and Stewart Valley (north of Swift Current). In 2000, additional funding was obtained from the Potash and Phosphate Institute of Canada, and Agriculture and Agri-Food Canada to further investigate the effect of potassium and sulfur. This is a joint project between the Indian Head Agricultural Research Foundation and Agriculture Agri-Food Canada.

The overall objective of this study is to develop management strategies which optimize economic returns to canaryseed producers. The specific objectives of this study are:

- To determine the effect of the rate of nitrogen fertilizer on the development and yield of canaryseed
- To study the impact of date of seeding on the development and yield of canaryseed
- To determine the effect of seeding rate on the development and yield of canaryseed
- To determine the effect of controlling Septoria Leaf Mottle on the yield of canaryseed
- To determine the effect of potassium and sulphur on the development and yield of canaryseed

Results and Discussion

Two problems occurred during the 1999 season. At Melfort hail damaged the plots in early August reducing yield and the reliability of the data obtain. At Weyburn, bird damage and drought at the end of the season reduced yields. In 2000, the Septoria leaf Mottle experiments were lost at Indian Head due to flooding and excessive wild oat pressure at Weyburn.

The yield of canaryseed did not readily respond to a change in the seeding rate. Slight increases in yield occurred at Melfort and Weyburn in 1999 (Figure 1) and 2000 (Figure 2) as the seeding rate was increased. The other five times this experiment was conducted, seeding rate had no effect on yield. These plots were all relatively weed free. It appears that varying the seeding rate will not greatly improve the yield stability of canaryseed, since the variation in yield between the sites was much larger than the response to increasing the seeding rate. There is likely some benefits to be obtained with higher seeding rates under weedy conditions. At the present time the data suggests that a seeding rate of 30 lbs an acre is appropriate.

Canaryseed yield responded to the addition of nitrogen fertilizer at 5 out of 9 times over the three years (Figures 3 and 4). At Stewart Valley, the canaryseed yield responded to higher nitrogen rates in 1999 and 2000. In 1999 at Indian Head, there was a statistically significant response, however, the response does not appear to be biologically significant or relevant to farmers growing canaryseed. The yield response at Indian Head and Weyburn in 2000 was very small even though it was statistically significant. Varying the amount of applied nitrogen does not help us much in understanding the yield variability in canaryseed.

The effect of potassium and sulphur on canaryseed yields were mixed in 2000 (Figure 5). Yield increased as potassium was increased at two locations, Indian Head and Stewart Valley, while at Saskatoon the 15 kg ha^{-1} rate lowered yield and the 30 kg ha^{-1} rate increased yield. Weyburn followed the trend observed at Saskatoon when sulphur wasn't added but potassium had no effect when sulphur was added. At Melfort, yield did not respond to potassium. The addition of sulfur decreased yield at Indian Head and increased yield at Stewart Valley. The levels of potassium and sulphur for each site are in Table 1. These results are too preliminary to draw strong conclusions except that potassium appears to have an effect on the yield of canaryseed

Delayed seeding of canaryseed had a large effect on yield (Figures 6 and 7). At Swift Current and Melfort in 1999 the first seeding date had the highest yield. At Swift Current large yield reductions occurred after the early May seeding date. At Melfort the yield decline as seeding was delayed may have been intensified by hail which occurred in early August. In addition the last seeding date had trouble ripening because of the cool growing season and frost occurred while it was in the seed filling stage of development. At Indian Head in 1998 and 1999 and Saskatoon in 1999, the response was slightly different. The mid May seeding date was the best in both years and surprisingly in 1999 the early June seeding date out yielded the early May seeding date at both locations. In 2000 the first seeding date had the highest yield at Indian Head and Melfort. Yield declined at these two locations as seeding was delayed. However, there was no yield response to seeding date at the other two locations Saskatoon and Swift Current. Seeding date can have a large effect on yield but not every year. At this point in the project, the data suggests that a mid May seeding date may on average provide the best yield. A fall seeded treatment with coated seed was added to the seeding date test at Indian Head for 2000. Unfortunately, spring emergence was low. I feel that this was due to technical problems that ended up placing the seed too deep. Fall planting is being tried again in 2001.

Septoria leaf mottle had a large effect on yield. Controlling Septoria leaf mottle with Tilt reduced the severity of the septoria at all three sites in 1999 (Figure 8) but not at Stewart Valley in 2000. Seed yield increased at 4 out of 6 site years (Figure 9) . At Indian Head in 1998 controlling the heavy infestation of Septoria Leaf Mottle with Tilt resulted in a 29% increase and controlling a moderate infestation at Indian Head in 1999 resulted in a 22% increase in yield. Even at Melfort in 1999 where yields were reduced by hail the application of Tilt resulted in a yield increase and in 2000 the yield increase was 40%. Only at Stewart Valley where the infestation of Septoria was light was there no response to the application of Tilt in 1999 and 2000. I believe that Septoria leaf mottle may be a part of the answer to the yield variability experienced by farmers growing canaryseed.

Only the yield data was presented in this report. The rest of the collected data is available on request. I would like to thank Saskatchewan Agriculture and Food, the Potash and Phosphate Institute of Canada, and Agriculture and Agri-Food Canada for their financial support. In 2001, we intend to continue the research projects we conducted in 2000.

Acknowledgements

This work would not be possible with out financial support from Saskatchewan Agriculture and Food, Agriculture and Agri-Food Canada, the Indian Head Agricultural Research Foundation and the Potash and Phosphate Institute of Canada. In addition I would like to thank Bob Linnell and the North East Agricultural Research Foundation for their help and support.

Table 1. Potassium and Sulphur Levels at the Test Sites in 2000

	South of Indian Head	Weyburn	Stewart Valley	Saskatoon	Melfort
			lbs/acre		
Potassium(0-6")	310	540	601	528	507
Sulphur(0-24")	31	25	15	59	53

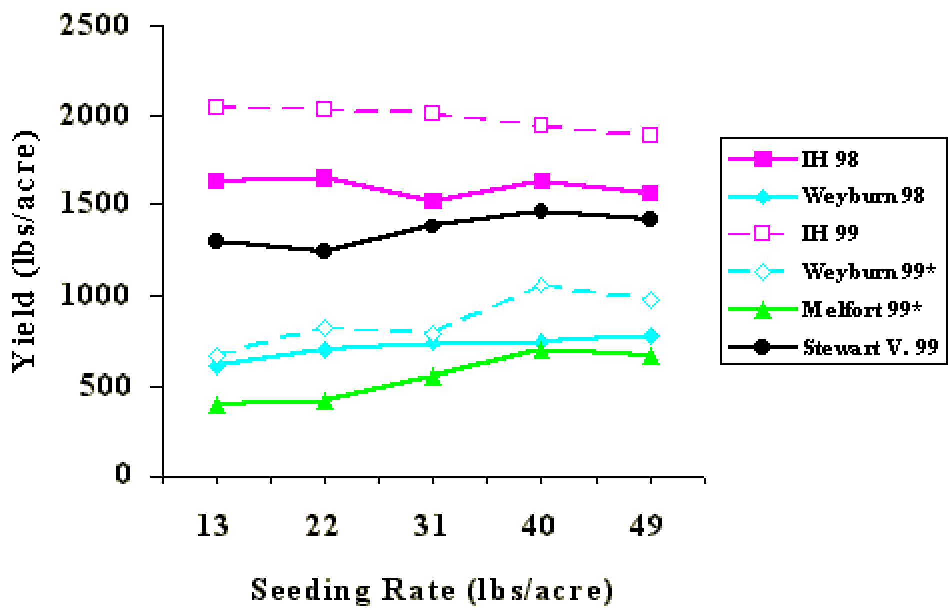

Figure 1. Seeding rate and canaryseed yield in 1998 and 1999

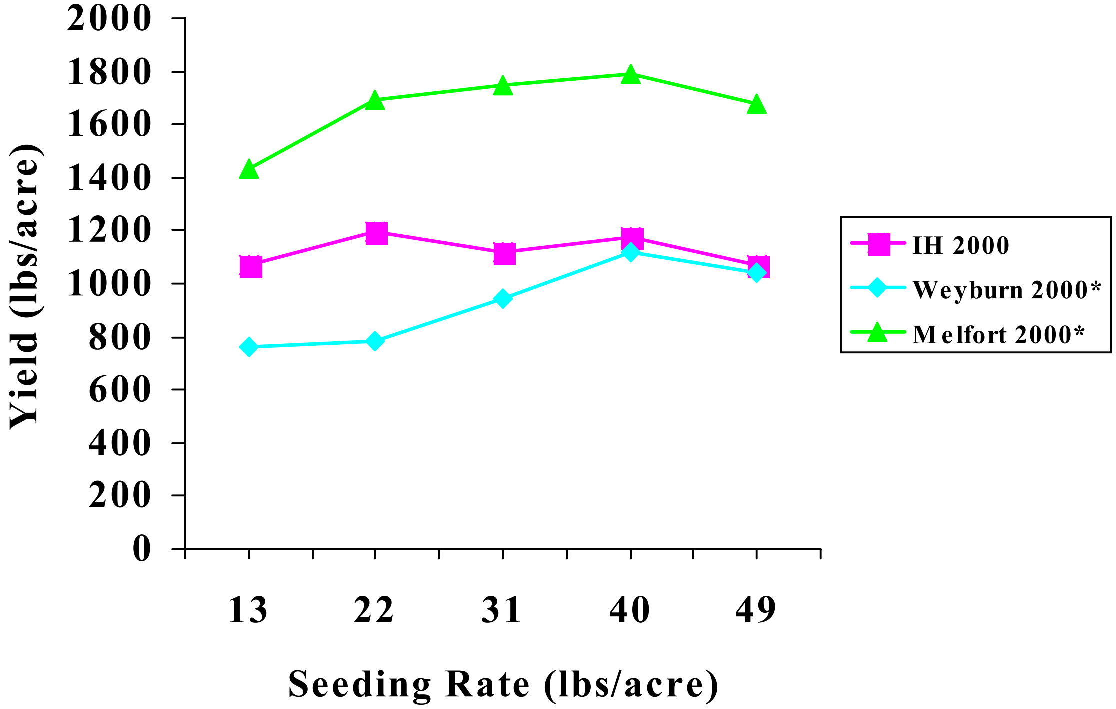

Figure 2. Seeding rate and canaryseed yield in 2000

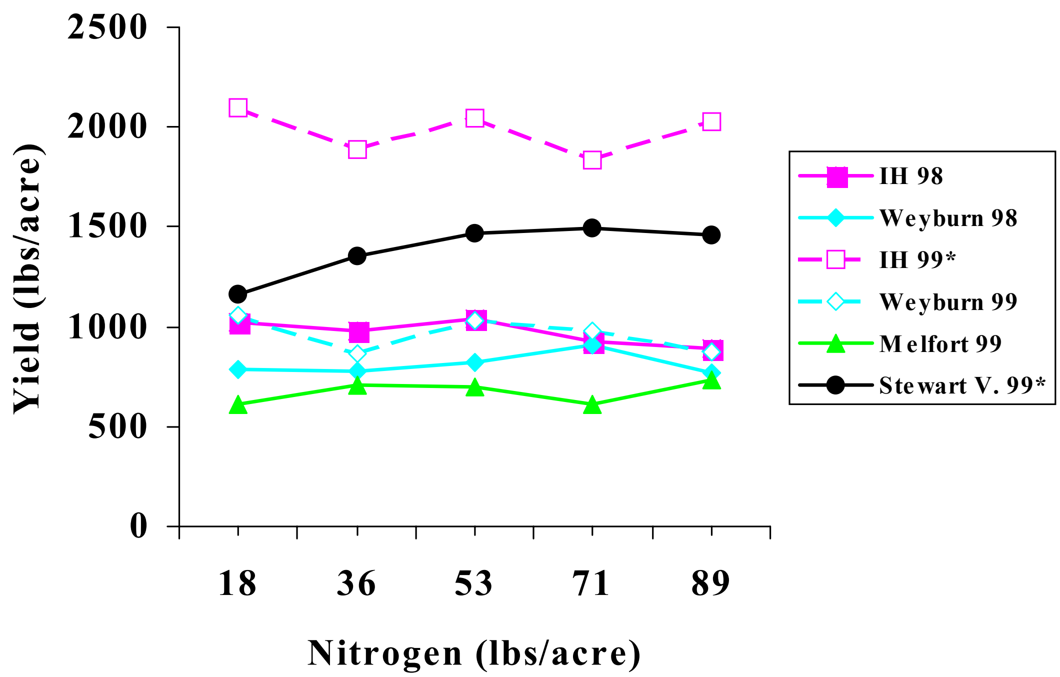

Figure 3. Nitrogen rate and canaryseed yield in 1998 and 1999

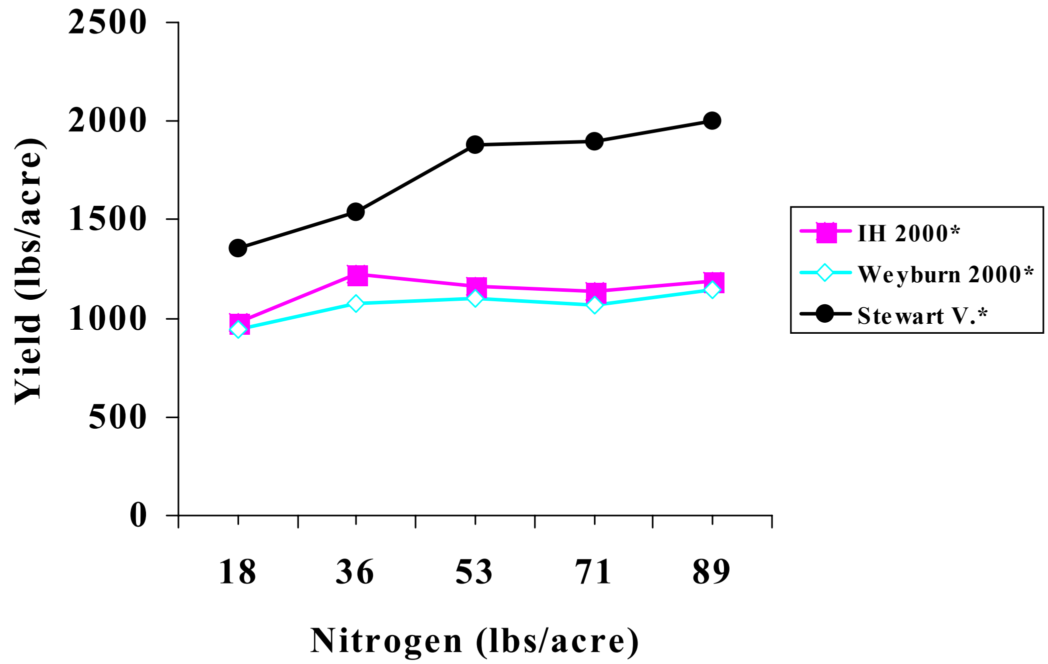

Figure 4. Nitrogen rate and canaryseed yield in 2000

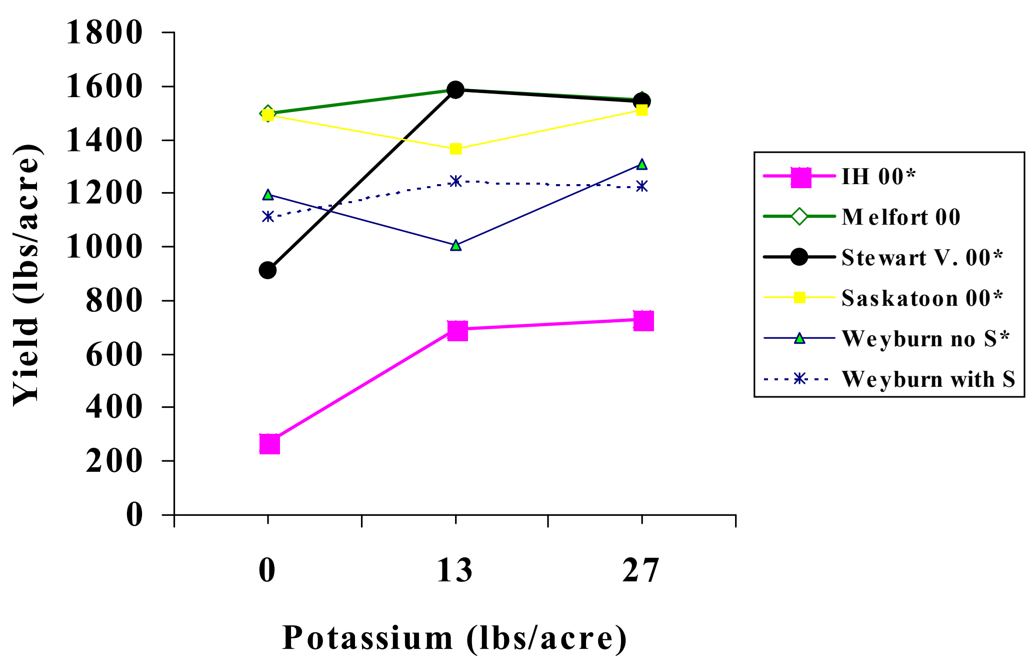

Figure 5. Potassium, sulphur and canaryseed yield in 2000

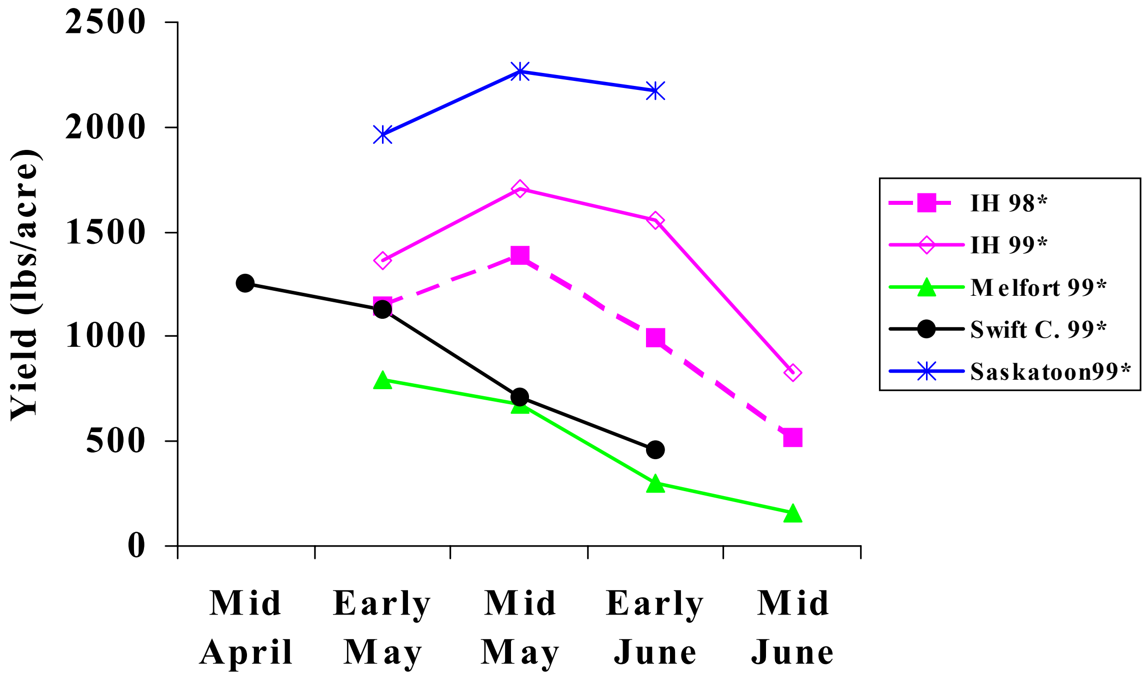

Figure 6. Seeding date and canaryseed yield in 1998 and 1999

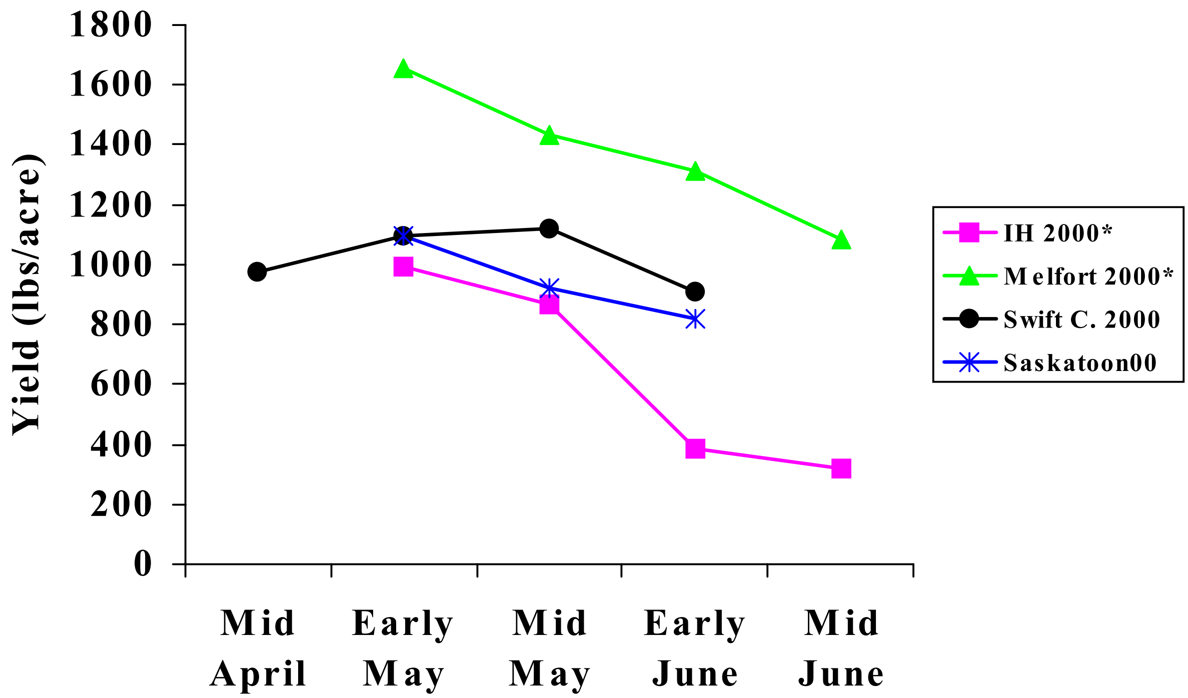

Figure 7. Seeding date and canaryseed yield in 2000