
How hungry are different *Brassica* oilseed crops for sulphur fertilizer to optimize seed yield, quality and S uptake in northeastern Saskatchewan?

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BACKGROUND

- Canola-quality *Brassica juncea* (i.e., *juncea* canola) has equal or superior seed and meal quality to conventional canola species.
- This non-GMO crop may provide growers in western Canada with options for diversifying canola production.

OBJECTIVE

- To determine the effects of sulphur (S) fertilization on growth/development, seed yield, quality and S uptake.
- To develop response curves for *juncea* canola in comparison with conventional mustard and Hybrid canola in the Parkland region of Saskatchewan.

MATERIALS AND METHODS

- Four oilseed crops, *Brassica napus* (cv. Invigor 2663 - Hybrid), *B. juncea* mustard (cv. Cutlass), and *B. juncea* canola (cv. Amulet and Arid), were evaluated at five rates of sulphur (S) fertilizer (0, 10, 20, 30 and 40 kg S ha⁻¹) at Star City, Saskatchewan in 2003 and 2004.
- Total precipitation over the growing season (May, June, July and August) was 169 mm in 2003 and 290 mm in 2004. In 2003, there was drought in the late growing season with much below normal precipitation in July and August (near flowering to seed filling).
- Data were collected for seed yield, straw yield, oil and protein concentration in seed, total S concentration in seed and straw, and S uptake in seed, straw and total plant (seed + straw).
- Response curves of these species to S input were developed for each year, and comparisons were made among conventional *juncea* mustard, *napus* Hybrid canola and *juncea* canola.

SUMMARY AND CONCLUSIONS

- All *Brassica* oilseed species responded positively (for seed yield and most other parameters) to S fertilizer application in both years but the responses varied with species and year.

- In 2003, drought during the late growing season near flowering and seed formation caused a drastic reduction in seed yield.
- Seed yield was highest with *juncea* mustard in a dry year (2003) and with Hybrid canola in a year with normal precipitation (2004).
- The effect of S deficiency on canola was more dramatic on seed yield than straw yield.
- Oil concentration in seed increased with S fertilization, but varied with oilseed species.
- Depending on the oilseed species, there was little or no response of protein concentration in seed to S fertilization
- In both years, considerably high concentrations of glucosinolate in seed were observed to accumulate with increasing S rate in *juncea* mustard. In other oilseed species, glucosinolate concentration in seed also increased with S fertilization but the values were small.
- For all oilseed species, seed yield was maximized at about 20-30 kg S ha⁻¹ rate.
- The response curves were fairly similar for all oilseed species. This suggests that S fertilizer management strategies should be similar for all of these oilseed species.
- That is, higher yielding types would require similar fertilizer S, but produce higher yield by using S more efficiently.

ACKNOWLEDGEMENTS

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Table 1. Influence of oilseed species and S fertilizer rates on the concentration of glucosinolates in seed in 2003 at Star City, Saskatchewan

Cultivar	Concentration of glucosinolates (mg kg ⁻¹) in seed at S rates (kg S ha ⁻¹)				
	0	10	20	30	40
Amulet (Juncea Canola)	n.d. ^z	4.52	8.37	9.93	12.5
Arid (Juncea Canola)	n.d.	2.20	3.20	4.19	4.70
Cutlass (Juncea Mustard)	0.60	25.9	61.2	72.6	83.4
Invigor 2663 (Hybrid Canola)	n.d.	3.31	6.67	8.14	8.44

^zn.d. refers to not done.

Table 2. Influence of oilseed species and S fertilizer rates on the concentration of glucosinolates in seed in 2004 at Star City, Saskatchewan

Cultivar	Concentration of glucosinolates (mg kg ⁻¹) in seed at S rates (kg S ha ⁻¹)				
	0	10	20	30	40
Amulet (Juncea Canola)	13.40	8.49	13.77	15.94	15.39
Arid (Juncea Canola)	8.68	6.35	7.59	8.89	8.77
Cutlass (Juncea Mustard)	33.72	60.18	62.17	75.71	83.40
Invigor 2663 (Hybrid Canola)	5.18	5.20	6.37	7.24	8.17

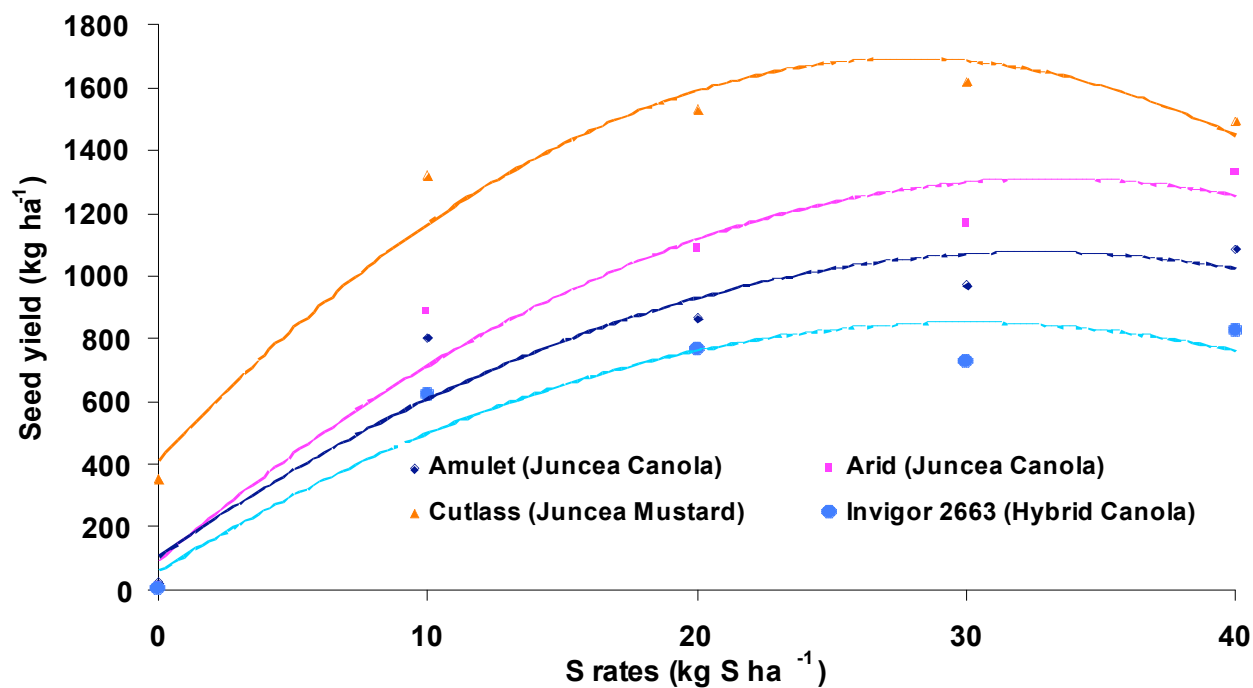


Figure 1. Seed yield response of *Brassica* oilseed species to S fertilizer rates in 2003 at Star City, Saskatchewan.

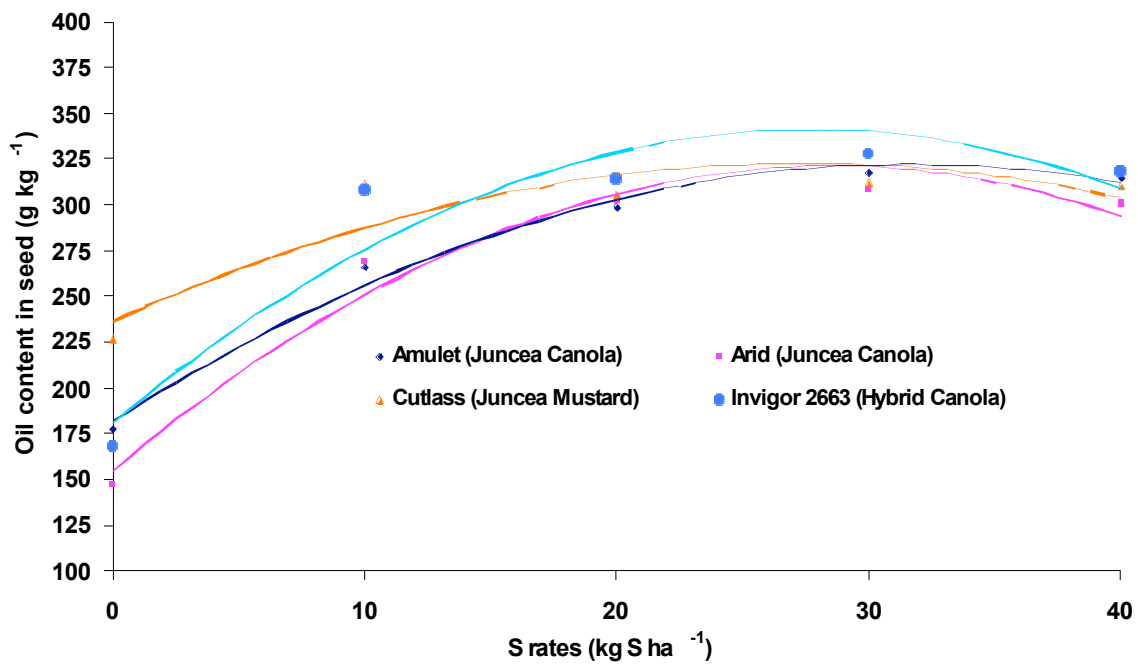


Figure 2. Oil content in seed of four *Brassica* oilseed species with four rates of S fertilizer applied at Star City, Saskatchewan in 2003.

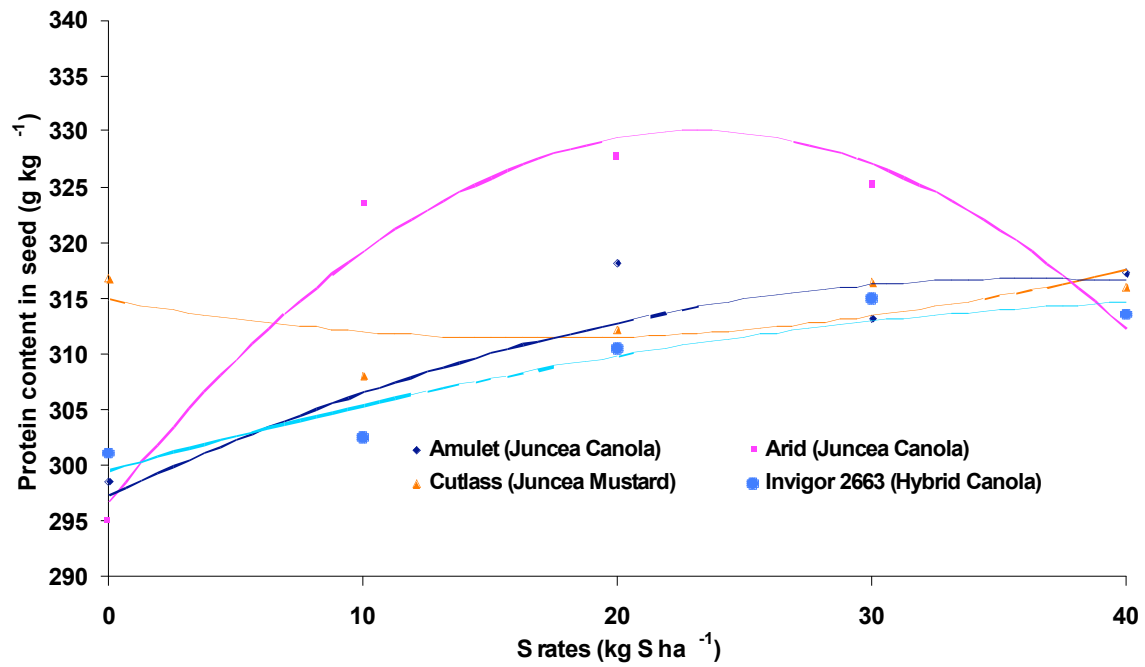


Figure 3. Protein content in seed of four *Brassica* oilseed species with four rates of S fertilizer applied at Star City, Saskatchewan in 2003.

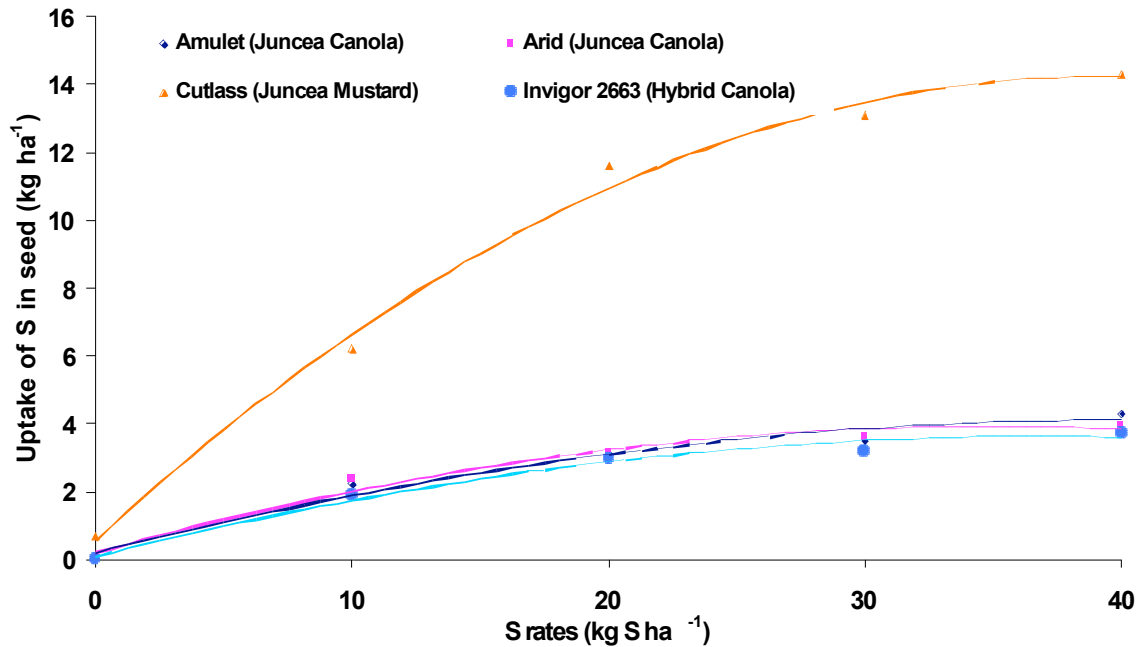


Figure 4. Uptake of S in seed of four *Brassica* oilseed species with four rates of S fertilizer applied at Star City, Saskatchewan in 2003.

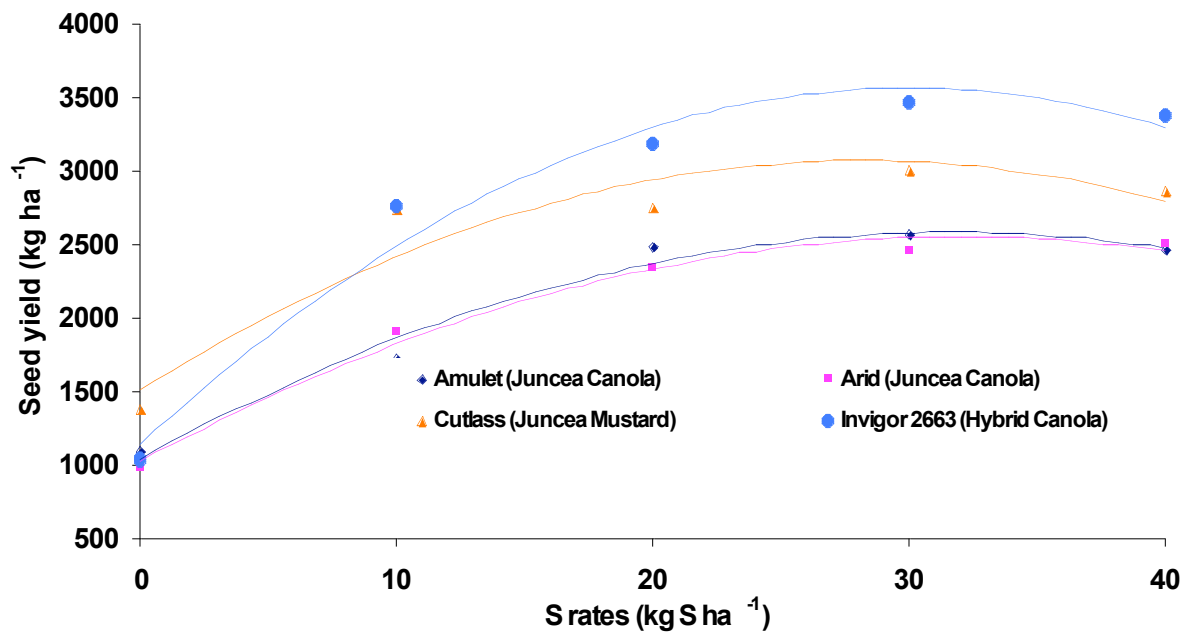


Figure 5. Seed yield response of *Brassica* oilseed species to S fertilizer rates in 2004 at Star City, Saskatchewan.

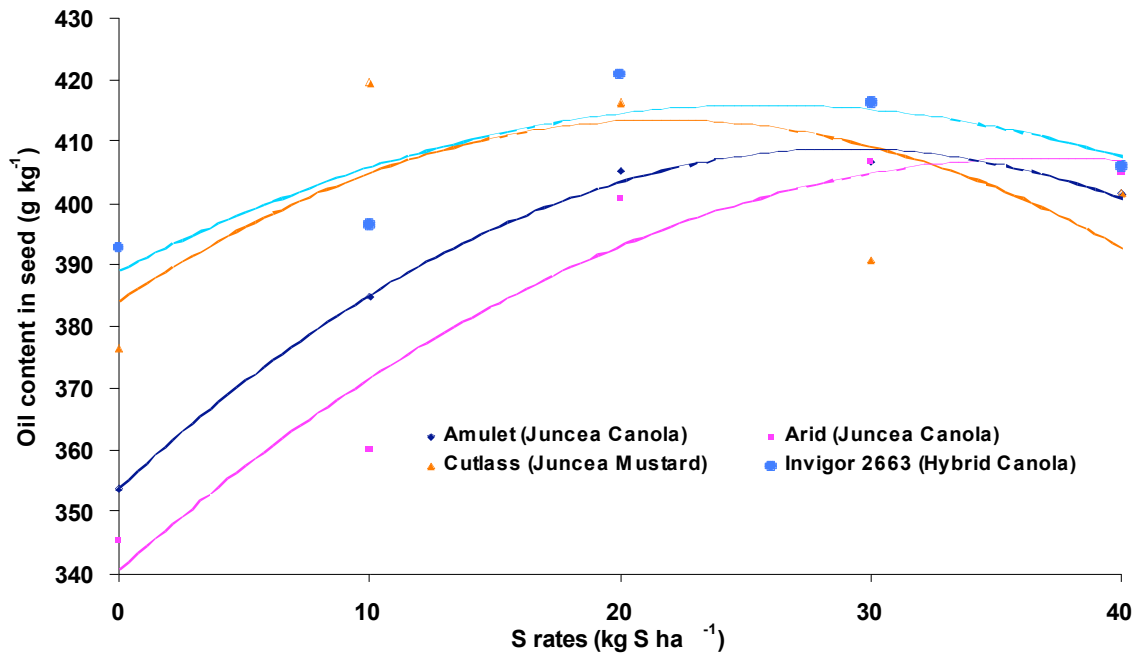


Figure 6. Oil content in seed of four *Brassica* oilseed species with four rates of S fertilizer applied at Star City, Saskatchewan in 2004.

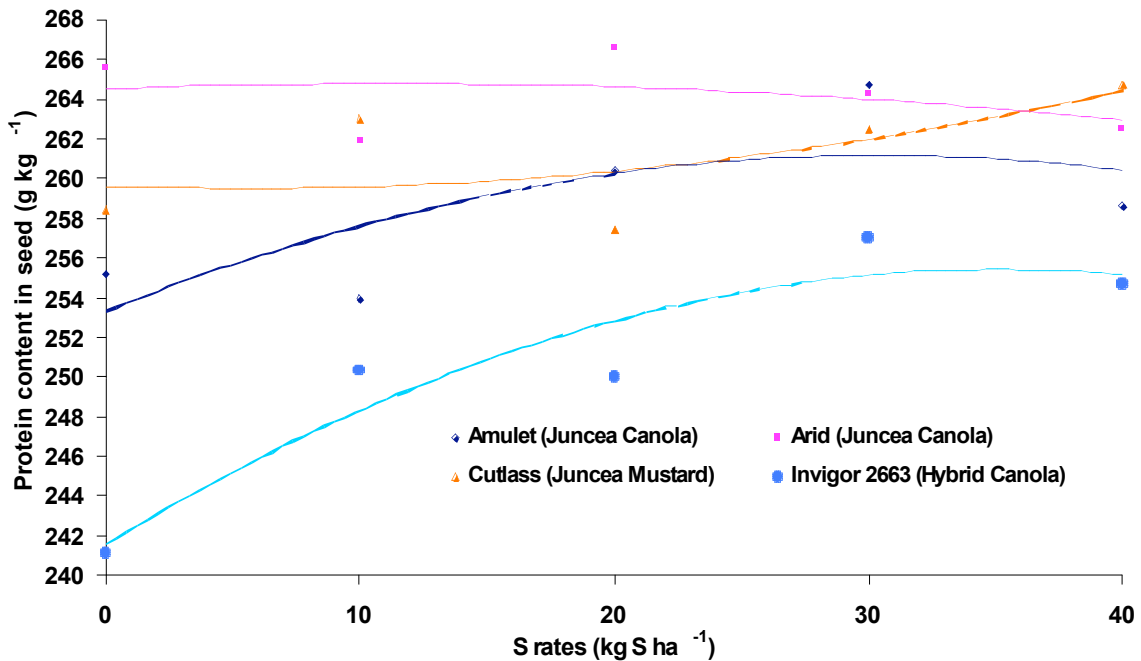


Figure 7. Protein content in seed of four *Brassica* oilseed species with four rates of S fertilizer applied at Star City, Saskatchewan in 2004.

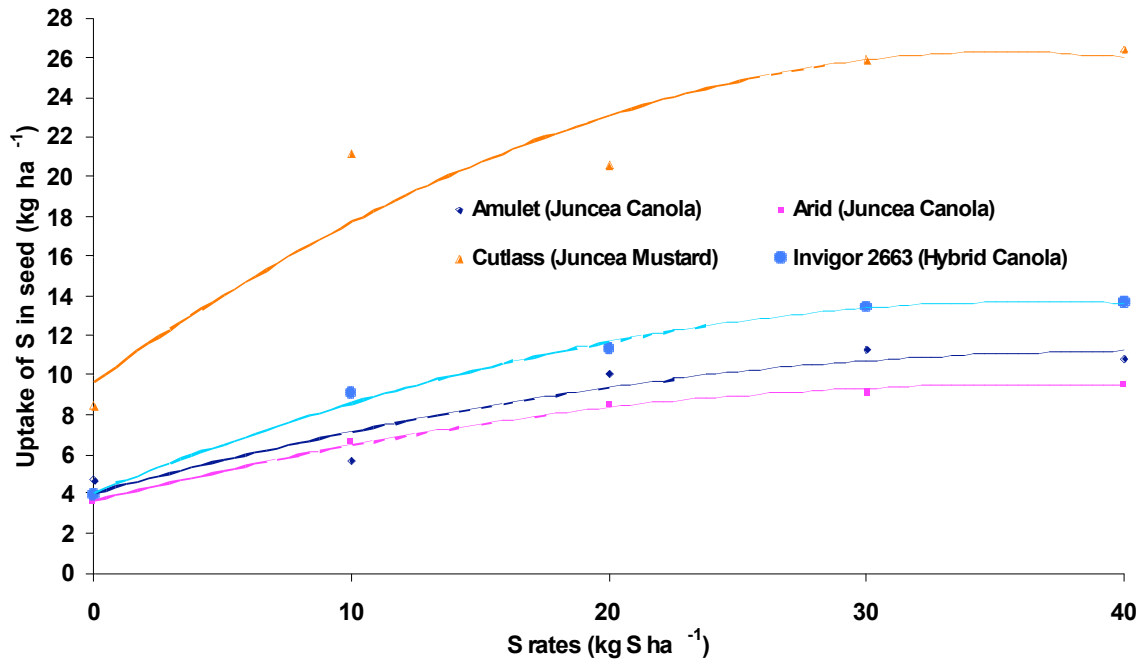


Figure 8. Uptake of S in seed of four *Brassica* oilseed species with four rates of S fertilizer applied at Star City, Saskatchewan in 2004.