Characterization of Total and Individual Sterols in Canola Sprouts

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ABSTRACT

- Canola sprouts contained, on an average, 36.3 g sterols in 100 g of unsaponifiable matter (UNSAP), 10.7 mg sterols in one g of oil, and 2.4 mg sterols in one g of dry sprouts.
- The contents of individual phytosterols (µg per g of oil) in canola sprouts were 1162 brassicasterol, 3799 campesterol, 34 stigmasterol, 5359 β-sitosterol, 201 Δ^5-avenasterol, and 97 Δ^7-stigmastenol.
- Canola lines had significant effects on contents of oil, brassicasterol, and campesterol.
- Locations had significant effects on oil, UNSAP, total sterols, brassicasterol, stigmasterol, and β-sitosterol.
- The concentrations of sterols were in the following decreasing order: β-sitosterol > campesterol > brassicasterol > Δ^5-avenasterol > Δ^7-stigmastenol > stigmasterol.
- These results indicate that canola sprouts may have the potential as a natural source of dietary sterols and might be desirable for human nutrition.

INTRODUCTION

- Sprouts have long been considered a nutritious and healthy food [1].
- In recent years, sprouts have become a popular healthy food in the USA and western meals. Numerous studies have demonstrated that sprouts are one of the most complete and nutritious foods [2, 3]. They are considered a predigested food, with a higher biological efficiency value and lower level of antiphysiologic factors than raw or cooked seeds.
- While little is known about sterols in canola sprouts, phytosterols have received increasing attention due to their health-promoting effects [15].
- Plant sterols, especially β -sitosterol and phytostanols, reduces blood pressure, serum cholesterol level and the risk of cardiovascular disease. They also have shown positive effects as anti-inflammatory, antitumer and antioxidant agents (5).
- Recent clinical and nutritional studies have demonstrated that plant sterol and stanol ester lowered LDL cholesterol by 9-14% (6, 7).
- The highest reduction is achieved at plant sterol or stanol ester doses of 1.6-2.0g/day (6, 7).

OBJECTIVES

- To characterize sterols in canola sprouts.
- To determine cultivar of canola sprouts as a dietary source of phytsterolsand growing location effects on sterols traits.
- To assess the potential

MATERIALS AND METHODS

- Seven canola cultivars (Acropolis, Banjo, Jetton, KS-7740, KSM3-1-124, Mussette and Virginia), grown at three locations in virginia (Orange, Petersburg, and Suffolk) during 2001-02 crop season.
- Canola seeds (25 g) were sprouted for a period of 6 days, under the laboratory conditions, in a wide mouth jar (9 cm x 9 cm x 16 cm) covered with a mesh screen top to insure sufficient air ventilation. Seeds were first soaked in room temperature water over night, then were kept moist by rinsing and draining twice a day and the jar inverted at a slight angle until the next rinse.
- T Oil, Unsaponifiable matter (UNSAP) and Sterols in canola sprouts and whole seeds were analyzed as described by Hamama et al. (8).
- Statistical analysis was conducted using SAS (9).

CONCLUSIONS

- Growing locations had much greater influence in contents of oil and sterols in canola sprouts.
- Canola sprouts have potential as a natural source of dietary sterols.
- Consumption of dietary sterols from canola sprouts might be more beneficial to human health than those from commercial edible vegetable oils.

RESULTS and DISCSSION

- Canola sprouts contained, on an average, 27.1 g oil in 100 g dry sprouts, 2.99 g UNSAP in 100 g of oil, 36.3 g sterols in 100 g of UNSAP, 10.7 mg sterols in one g of oil, and 2.4 mg sterols in one g of dry sprouts (Table 1, 2).
- The contents of individual phytosterols (µg per g of oil) in canola sprouts were 1162 brassicasterol, 3799 campesterol, 33 stigmasterol, 5359 β-sitosterol, 201 Δ^5-Avenasterol, 97 Δ^7-Stigmastenol, and 4 Δ^7-Avenasterol (Tables1, 2).
- Canola genotypes had significant effects on contents of oil, brassicasterol, and campesterol (Table 1).
- Locations had significant effects on oil, UNSAP, total sterols, brassicasterol, stigmasterol, and β-sitosterol (Table 2).
- Sprouts from seeds produced in Petersburg had the highest concentration of β-sitosterol (4040.2 µg/g oil) , campesterol (5840.6 µg/g oil) and brassicasterol (1250.1 µg/g oil) where as Suffolk had the lowest brassicasterol (1023.4 µg/g oil) and B-sitosterol (5109.6 µg/g oil), respectively.
- Overall, our data show that canola sprouts are a good source of dietary sterols (2.44 mg/g dry sprouts) as compared to alfalfa (0.94mg/g sprouts) and soy bean (1.65 mg/g sprouts) sprouts (10, 11).

Table 1. Sterols in sprouts of seven canola cultivars grown at three locations during 2001-2002 season in Virginia.

Genotype	Oil (%)	UNSAP (g/100g oil)	UNSAP (mg/100g sprouts)	sterols (g/100g UNSAP)	sterols (mg/g oil)	Sterols (mg/100g sprouts)
Acropolis	29.05	2.90	8.40	33.53	10.33	2.47
Banjo	27.03	3.20	8.57	33.43	10.52	2.75
Jetton	26.33	3.15	8.15	37.57	10.62	2.57
KSM31124	26.85	2.87	7.62	37.77	10.53	2.28
Musette	27.88	2.93	8.07	38.48	11.00	2.42
Virginia	25.40	2.85	7.17	37.32	10.50	2.07
Mean*	27.21	2.99	8.03	36.33	10.66	2.44
LSD(.05)	1.86	ns	ns	ns	ns	ns

Genotype	BS^y	CS^y	Ss^y	βS^y	Δ^5-A^y	Δ^7-S^y
Acropolis	881.67	3911.5	26.33	5227.0	187.00	84.83
Banjo	954.67	3925.5	40.00	5361.2	166.50	73.00
Jetton	1513.20	3617.7	46.00	6120.3	213.50	95.83
KS7740	932.00	3889.0	24.67	4982.5	199.33	101.67
KSM3-1-124	1346.00	4002.2	34.83	4805.5	243.33	85.83
Musette	1024.50	4078.5	28.50	5522.3	212.17	132.17
Virginia	1481.50	3171.7	34.00	5497.0	185.50	104.50
Mean*	1161.90	3799.4	33.48	5359.4	201.05	96.83
LSD(.05)	271.80	527.5	ns	ns	ns	ns

* Means over three locations.

y BS= Brassicasterol; CS= Campesterol; SS= Stigmasterol; βS= β-sitosterol; Δ^5-A= Δ^5-Avenasterol; Δ^7-S= Δ^7-Stigmastenol. All sterols expressed as µg/g of oil.

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Table 2. Sterols in sprouts of seven canola cultivars grown at three locations during 2001-2002 season in Virginia.

Genotype	Oil (%)	UNSAP (g/100g oil)	UNSAP (mg/100g sprouts)	Sterols (g/100g UNSAP)	Sterols (mg/g oil)	Sterols (mg/g sprouts)
Orange	25.30	3.01	7.57	34.79	10.33	2.31
Petersburg	26.09	3.28	8.54	35.41	11.43	2.85
Suffolk	30.24	2.67	7.99	38.79	10.23	2.15
Mean	27.21	2.99	8.03	36.33	10.66	2.44
LSD(.05)	1.22	0.30	ns	ns	1.05	0.47

Genotype	BS^y	CS^y	Ss^y	βS^y	Δ^5-A^y	Δ^7-S^y
Orange	1212.3	3632.6	39.50	5128.1	196.5	117.4
Petersburg	1250.1	4040.2	25.07	5840.6	184.6	78.6
Suffolk	1023.4	3725.4	35.86	5109.6	222.0	94.5
Mean*	1161.9	3799.4	33.48	5359.4	201.1	96.8
LSD(0.5)	271.8	ns	11.66	584.1	ns	ns

*Means over seven canola cultivars.

y BS= Brassicasterol; CS= Campesterol; SS= Stigmasterol; βS= β-Sitosterol; Δ^5-A= Δ^5-Avenasterol; Δ^7-S= Δ^7-Stigmastenol. All sterols expressed as µg/g of oil.

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