PULSE STARCH

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PULSE STARCH

Pulse Starch Characteristics[1-8]

- High amylose content: ~30% amylose; 70% amylopectin*
- Characteristic “C” crystallization pattern: differ from cereal starches (A pattern) and tuber starches (B pattern)
- Wide variety of swelling power and solubility available
- High degree of retrogradation
- High thermal stability
- High gelatinization temperature
- Relatively high resistance to shear thinning
- High gel elasticity
- Air classification and wet-milling processes of field peas can fractionate field pea flour into starch concentrates containing up to 60–80% starch

*Experimental pea varieties have up to 70% amylose

Health Benefits of Pulse Starches

- Good source of resistant starch types RSII and RSIII
- Pulse starches are slowly digested contributing to a low glycemic index profile
- High satiety factor
- Native pulse starches are more digestible than potato starch or high amylose maize starch

PULSE STARCH

Carbohydrate Characteristics of Canadian Pulses [3,9-15]

Pulse	Total Carbohydrate	Starch	Amylose	Granule Description	Unique Characteristic
Chickpea* *(Cicer arietinum)*	52.4–70.9%	33.1–43.9	20.5–29.2	Oval shaped, 20–35 µm in size	High swelling content
Lentil** *(Lens culinaris)*	61–67%	41.5–48.5	22.5–28.3	Ellipsoid 10–30 µm	High water binding capacity (92–98%)
Peas *(Pisum sativum)*	56–74%	41.6–49.0	20.7–33.7	Oval or spherical, large and small, 5–30 µm	Develop viscosity slowly, wide variety of viscosities
Beans*** *(Phaseolus vulgaris)*	54.6–76%	31.8–45.3	19.9–29.6	Usually oval, but sometimes elliptical, 10–42 µm	High resistance under shear

*Includes Desi and Kabuli chickpeas. **Includes green and red lentils. ***Includes red, light red and white kidney beans, navy, black turtle, cranberry, dutch brown, great northern, pinto, small red and pink beans.

Comparison of Pulse Swelling Power @ 60°C (courtesy of Q. Liu)

Starch Source	Swelling Power
Bean	10–30
Pea (smooth)	16–19
Chickpea	15–18
Lentil	21–22

Gelatinization (thermal properties) (courtesy of Q. Liu)

Starch	To (°C)	Tp (°C)	Te (°C)	H (J/g)
Bean	62–72	64–76	70–80	13–17
Pea	55–61	60–68	75–80	14v23
Chickpea	~60	~65	~75	N/A
Lentil	~47	~57	~77	14.2
Corn	~62	~75	~85	13

Applications[16]

Flours/Starch Concentrates	Starch Concentrates	Resistant Starches
• In composite flours • Baked goods • Expanded snacks • Gravies • Instant soups • Stuffing mixes	• Good in high temperature extrusion processes for snack foods • Gluten free noodles • Meat binder	Fibre fortification of: • White pan breads • Pizza crusts • Tortillas • Pasta • Bakery mixes • Sweet goods

Canadian Researchers

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- Functionality and food and non-food utilization of pulse and cereal starches

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