



Breeding for Grain Quality

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There is heritable variation in grain protein content and TKW

Grain protein and thousand kernel weight (TKW) have significant genetic components and are weakly anti-correlated.

We can breed for higher protein content and TKW

Grain protein content can be assessed through wet chemistry or NIR models. We have used NIR to select for higher grain protein in some of our breeding populations.

TKW was very high in some cultivars from China (Han-NW, Han-NE, Han-FN-H). We have selected within these cultivars for adaptation to NY and low THC %.

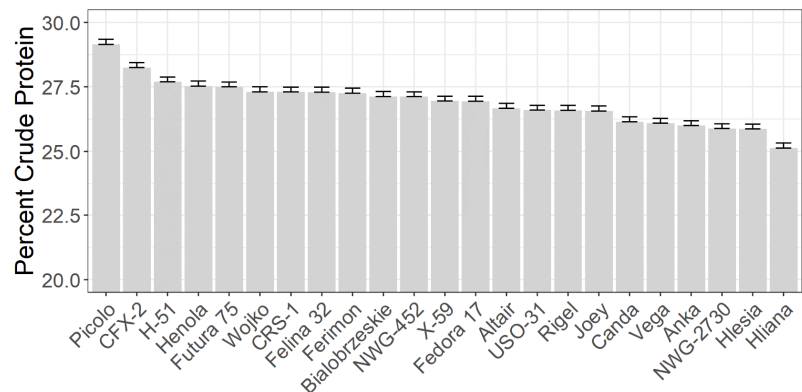


Figure 1. Crude protein content of 23 cultivars grown in 2020.

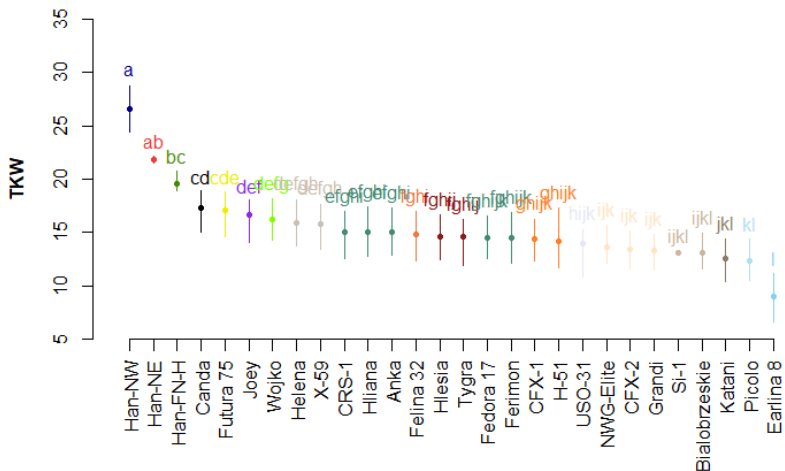


Figure 2. Thousand kernel weight of 28 cultivars grown in 2019.

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Functional characterization of hemp protein

We characterized the protein from press cake of dehulled seeds from six cultivars for solubility, foaming, and emulsion parameters. We also determined proportions of specific seed storage proteins (edestin, vicilin, and albumin).

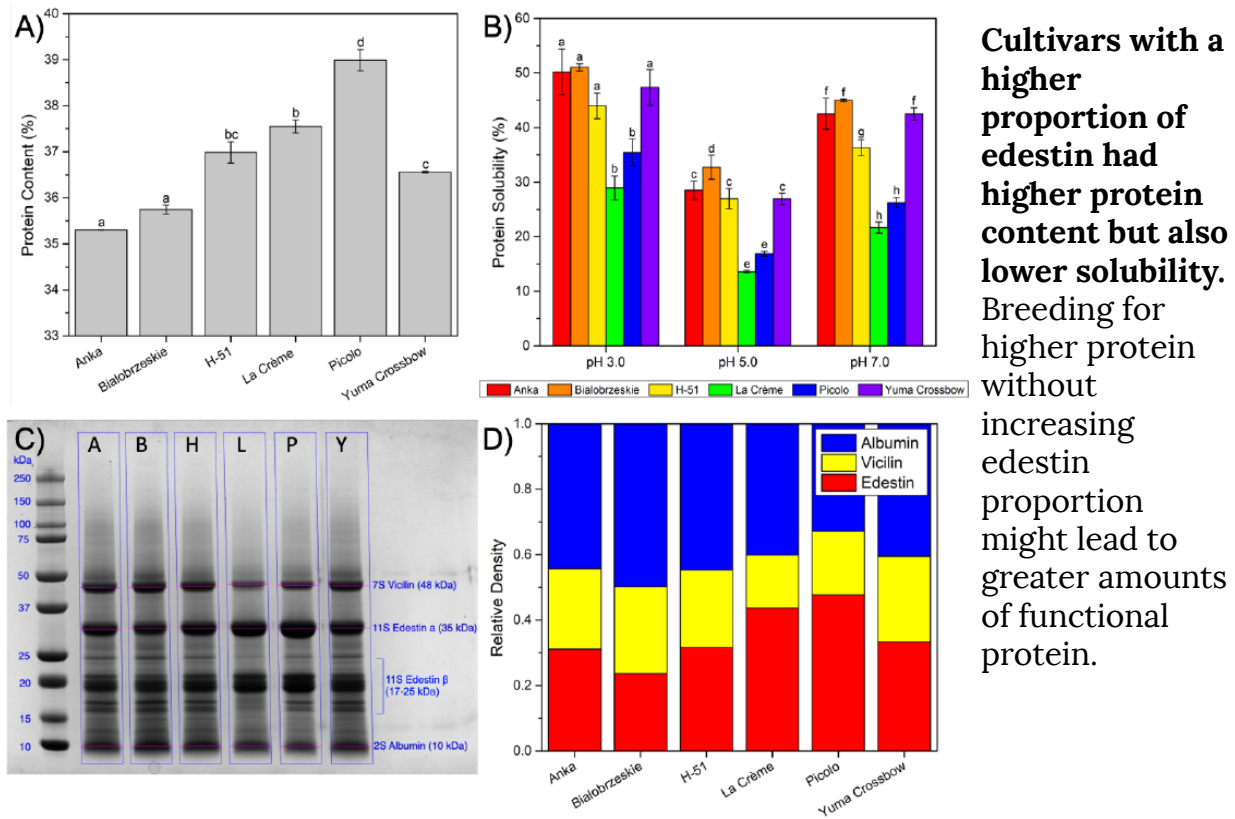


Figure 3. Protein content, solubility, and composition of six hemp seed cultivars. A) Protein concentration in dehulled hemp hearts. B) Solubility of hemp seed protein isolates at a pH of 3.0, 5.0, and 7.0. C) SDS-PAGE gel of protein isolates and D) quantified relative band densities for vicilin, α edestin, and albumin bands.

Market Classification	Cultivar Name	Protein Content	Solubility			Functionality at pH 7.0				
			pH 3.0	pH 5.0	pH 7.0	Emulsion Activity	Emulsion Stability	Emulsion Droplet Size	Foaming Capacity	Foaming Stability
Fiber/Grain	Anka	-	+		+	+			+	
Fiber/Grain	Bialobrzeskie		+	+	+	+				+
Fiber	H-51		+				-		-	
Cannabinoid	La Crème		-	-	-	-			-	-
Grain	Piccolo	+	-	-	-	-			-	-
Fiber/Grain	Yuma Crossbow		+		+				+	

Table 1. Qualitative comparison of protein content, solubility, and functionality for six cultivars