Winter Canola Response to Nitrogen Rate and Timing in Semiarid Mediterranean Conditions

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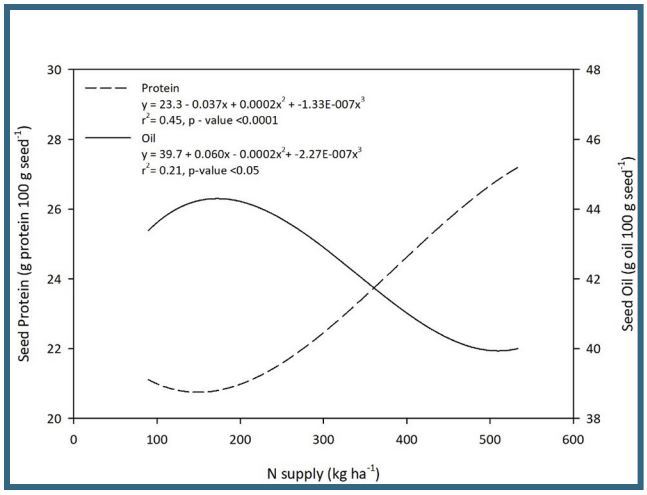

Figure 1. Seed protein and oil concentrations in response to nitrogen supply (fall residual N + spring fertilizer N + mineralized N) at 2016-17 and 2017-18 winter canola sites.

while minimizing environmental losses. Nitrogen rate and timing studies were conducted over two years at seven locations across the different precipitations zones of the iPNW. Nitrogen was applied as surface granular urea, with six rates from 0 to 240 kg N ha^{-1} applied in fall, spring and split applications. There was no yield response to N application at six of the seven sites, suggesting that the high N uptake efficiency of canola and high N content of soils (86-182 kg inorganic N ha^{-1}) limited yield

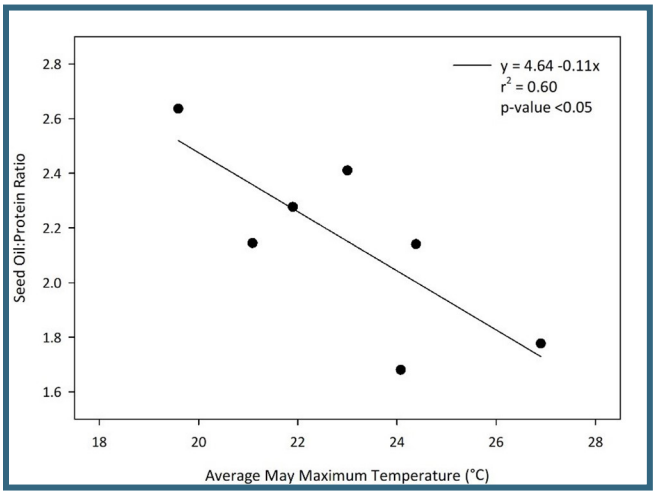

Figure 3. Average seed oil: protein ratio in response to average May maximum temperature at winter canola sites in the 2016-17 and 2017-18 crop year.

Integrating a new crop into a cropping system requires an understanding of nutrient use, specifically on the rate and timing of fertilizer applications in relation to soil type and climatic conditions. In the semi-arid dryland region of the inland Pacific Northwest (iPNW) where wheat (*Triticum aestivum* L.) covers 60% of the rainfed agricultural area, winter canola (*Brassica napus* L.) offers an economically viable rotation to wheat, providing breaks in pest and disease cycles and soil health benefits. Production in Washington state has increased from 4,000 to 28,000 hectares in the recent decade, yet little regional fertility research has been conducted (NASS, 2018). With a higher nitrogen (N) requirement and a lower nitrogen use efficiency (NUE) than wheat, canola requires unique N management to maximize economic return on fertilizer

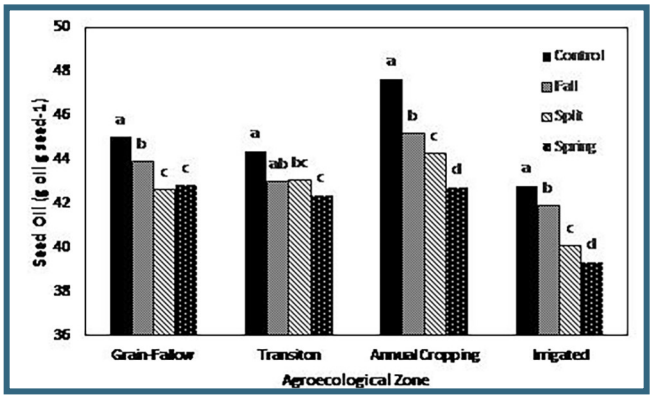

Figure 2. The relationship between seed oil content and timing of N application for the different agroecological classes. Rates of N are averaged across the various timings.

responses to applied N. Nevertheless, seed quality was affected by N, with increasing rates and later application timings leading to higher protein and lower oil content. Additionally, a relationship between temperature during flowering and seed quality was observed, with the ratio of seed oil to protein decreasing as average maximum May temperature increased. This research suggests that N management decisions should be conservative and made with the end uses of canola in mind, specifically whether maximizing protein or oil content is more desirable.