

PROGRESS REPORT

PROJECT NO: BJKD35

TITLE: Determine Optimum Agronomic Practices to Maximize Productivity of ‘Pacific Gold’ Oriental Mustard and ‘Kodiak’ Brown Mustard

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ACCOMPLISHMENTS:

The effects of five available nitrogen rates (50, 75, 100, 125 and 150 lb/available N/acre) and three seeding rates (3, 4.5 and 6 lb seed/acre) on the field performance of Pacific Gold and Kodiak was determined at two locations (Moscow and Genesee) from early and late planting dates in spring 2004.

Prior to planting soil samples were taken to determine base nitrogen level. Nitrogen treatments were added such that total available nitrogen was 50, 75, 100, 125, and 150 lb N/acre. The experimental design of the complete trial at each site was a strip-split plot design with three replicates (i.e. 2 cultivars x 5 nitrogen levels x 3 seed rates x 3 replicates = 90 plots/site). Plant growth was monitored throughout the growing season and variables recorded included plant stand counts, flower start date, flower end date, plant height and maturity. At harvest, seed from each plot was harvested and the seed weighed. A sub-sample from each plot was removed, and the seed used to determine oil content.

Averaged over all planting dates, sites, nitrogen application rates and seeding rates Pacific Gold produced 1,693 lb/acre while Kodiak yield was significantly reduced at 1,374 (Table 1). Pacific Gold has significantly higher seed oil content and plants were 3 inches shorter at maturity than Kodiak.

Table 1. Seed yield, plant stand counts, days from planting to 50% bloom, and plant height of Pacific Gold and Kodiak Oriental mustard cultivars, averaged over all treatments.

Cultivar	Seed yield -- lb/acre --	Oil Content ---- % ---	Plant stand - count/ft -	Days to Flower --- days ---	Plant height -- in --
Pacific Gold	1,693 ^a	33.6 ^a	9.4	60	59 ^b
Kodiak	1,374 ^b	29.8 ^b	9.6	60	61 ^a
LSD 5%	50	0.2	n.s.	n.s.	1.2

Means within columns assigned different superscript letters are significant (P<0.05).

Increased nitrogen application had significant impact on seed yield (Table 2). The relationship between nitrogen applications and seed yield was significantly linear for both cultivars. Pacific Gold, however, had a greater nitrogen response than Kodiak (Figure 1). Increasing nitrogen application rate by 1 lb/acre resulted in a 7.1 lb/acre increase in Pacific Gold seed yield while 1 lb/acre increase in nitrogen application related to only a 3.7 lb/acre yield increase in Kodiak. Seed

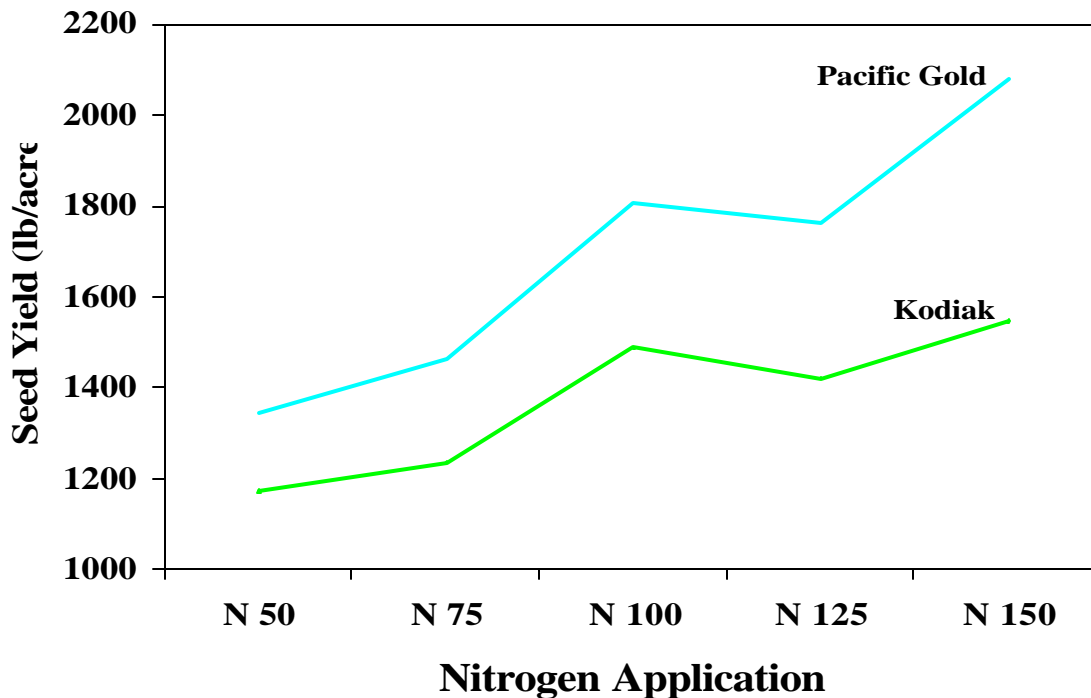
oil content was linearly related to nitrogen application. Here increased nitrogen application caused a decrease in seed oil content. As both Pacific Gold and Kodiak are designated as condiment Oriental and brown mustard, respectively, lower oil content is considered desirable over high oil content. As would have been expected, increased nitrogen application resulted in significantly taller plants.

Table 2. Seed yield, plant stand counts, days from planting to 50% bloom, and plant height after application of five nitrogen rates averaged over all treatments.

Nitrogen Rate	Seed yield	Oil Content	Plant stand	Days to Flower	Plant height
	-- lb/acre --	--- % ---	- count/ft -	--- days ---	-- in --
50 lb N	1,258 ^c	32.4 ^a	9.7	60.8 ^a	54 ^b
75 lb N	1,349 ^c	32.2 ^{ab}	9.7	59.8 ^c	56 ^b
100 lb N	1,646 ^{ab}	31.6 ^{bc}	9.5	60.0 ^c	63 ^a
125 lb N	1,592 ^b	31.4 ^{bc}	9.2	60.4 ^b	63 ^a
150 lb N	1,813 ^a	31.1 ^c	9.2	60.6 ^{ab}	65 ^a
LSD 5%	205	0.8	n.s.	0.3	3.5

Means within columns assigned different superscript letters are significant (P<0.05).

Figure 1. Yield response of Pacific Gold and Kodiak to increased nitrogen.



Significant yield loss was observed when the seeding rate was reduced from 4.5 lb/acre to 3 lb/acre (Table 3). There was no significant yield increase associated with seeding rates higher than 4.5 lb/acre. As expected, higher seedling stand counts were associated with increased seeding rates. Plants from the highest seeding rate treatment flowered about a half day earlier on average than the 4.5 and 3 lb/acre rates. This is likely related to greater inter-plant competition at the higher seeding rates.

Seed yields from early seeding dates were significantly higher for both cultivars compared to seedling 14 days later (Table 4). Averaged over both cultivars, seed yield from the early plantings produced 1,825 lb/acre while later planting yield were 32% lower at 1237 lb/acre. Later planting was related to significantly higher seedling stand counts and lower oil content. The former is likely due to higher soil temperatures at later planting which resulted in higher seedling emergence, while the later is most likely related to greater heat and drought stress of the later plantings, which had fewer days from bloom to maturity compared to the early plantings. The later seeding dates resulted in a shorter period from planting to flowering than was observed with the early planting.

Table 3. Seed yield, plant stand counts, days from planting to 50% bloom, and plant height of three seeding rates averaged over all treatments.

Seeding rate	Seed yield	Oil Content	Plant stand	Days to Flower	Plant height
	-- lb/acre --	--- % ---	- count/ft -	--- days ---	-- in --
3.0 lb/acre	1,478 ^b	31.6	6.6 ^c	60.5 ^a	61
4.5 lb/acre	1,555 ^a	31.7	8.6 ^b	60.4 ^a	61
6.0 lb/acre	1,568 ^a	31.8	13.2 ^a	60.1 ^b	59
LSD 5%	60	n.s.	0.8	0.2	n.s.

Means within columns assigned different superscript letters are significant (P<0.05).

Table 4. Seed yield, plant stand counts, days from planting to 50% bloom, and plant height from early and late planting averaged over all treatments.

Planting date	Seed yield	Oil Content	Plant stand	Days to Flower	Plant height
	--- lb/acre ---	--- % ---	- count/ft -	--- days ---	-- in --
Early	1,825 ^a	32.8 ^a	8.5 ^b	65 ^a	59
Late	1,237 ^b	30.7 ^b	10.5 ^a	56 ^b	62
LSD 5%	217	0.4	1.2	0.3	n.s.

Means within columns assigned different superscript letters are significant (P<0.05).

PROJECTIONS:

Industry and grower interest in Pacific Gold in northern Idaho has escalated dramatically since its release in 2001, and current interest is evident by the high demand to purchase certified seed this year. Although Kodiak has only just been commercially released we hope that this cultivar will offer PNW growers greater flexibility in end-use products in their rotation. However, this is the first research that has investigated the effects of seeding date, seeding rate or nitrogen on productivity of *B. juncea* mustard. It is difficult to make strong recommendations or conclusions based on a single year of results and it is hoped to continue this type of agronomic research in future years. Results from this study are posted on the *Brassica* Breeding website <http://www.ag.uidaho.edu/brassica/>. With further years of experimentation this information will be available to maximize productivity and grower profitability in growing mustard crops.

PUBLICATIONS:

Determine optimum agronomic practices to maximize productivity of 'Pacific Gold' Oriental mustard and 'Kodiak' brown mustard. 2005. J. Olmstead, J. Brown, D. Wysocki and J.B. Davis. University of Idaho. <http://www.ag.uidaho.edu/brassica/>.