# Field Pea

Canada-Saskatchewan Irrigation Diversification Centre

## Optimum Seeding Rates for Irrigated Pea Production

*Research Highlights: March 2001*

### Introduction

Proper seeding rate is important for optimizing the yield and economic return for irrigated field pea. Seed constitutes a major input cost for field pea production, especially for large seeded varieties. Optimum seeding rate should maximize yield while minimizing seed cost. Peas are a "plastic" crop, able to compensate for low plant densities with increased branching and pod set. In the absence of moisture stress, this plasticity appears to be even greater, although it varies among pea varieties. Normal-leaf and tare-leaf varieties tend to be more plastic than semi-leafless varieties. Therefore, under irrigation, the optimum seeding rate for normal-leaf and tare-leaf varieties may be lower than for semi-leafless varieties.

### Study Description

Researchers at the Canada-Saskatchewan Irrigation Diversification Centre (CSIDC) studied the effect of seeding rate on the yield of semi-leafless (Carneval, Keoma, Radley), tare-leaf (Express) and normal-leaf (Grande) pea varieties. Peas were seeded at five target rates ranging from 20-100 seeds/m$^2$ (1.9-9.3 seeds/ft$^2$) (Table 1). Actual seeding rate (kg/ha or lb/ac) was different for each variety based on its seed weight (Table 1). The study was conducted in statistically designed small plots. Standard fertilizer, weed control, irrigation and other management practices were followed to grow the crop. Plant stand, yield and seed weight were evaluated.



*Semi-leafless Carneval and normal-leaf Grande at seeding rate of 60 seeds/m$^2$ (5.6 seeds/ft$^2$). Grande provides more ground cover early in the season.*

### Plant Stand

Plant stand did not increase in direct proportion to seeding rate. At high seeding rates (80 seeds/m$^2$; 7.4 seeds/ft$^2$ and over), plant stands were not proportional to the seeding rate. As seeding rate increases, plants become more crowded causing in-row competition and reduced emergence.

### Yield Response

Yield response to seeding rate was different for the various varieties. The optimum seeding rate was 80 seeds/m$^2$ (7.4 seeds/ft$^2$) for Keoma, 60-80 seeds/m$^2$ (5.6-7.4 seeds/ft$^2$) for Carneval, 60 seeds/m$^2$ (5.6 seeds/ft$^2$) for Express and Grande, and 50 seeds/m$^2$ (5.1 seeds/ft$^2$) for Radley (Table 2).

**Table 1. Field pea varieties and seeding rates.**

| Target Seeding Rate[2] | | Semi-leafless | | | | | | Tare-leaf | | Normal-leaf | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Carneval | | Keoma | | Radley[1] | | Express | | Grande | |
| seeds/m$^2$ | seeds/ft$^2$ | kg/ha | lb/ac | kg/ha | lb/ac | kg/ha | lb/ac | kg/ha | lb/ac | kg/ha | lb/ac |
| 20 | 1.9 | 47 | 42 | 36 | 32 | - | - | 39 | 35 | 43 | 38 |
| 40 | 3.7 | 94 | 84 | 72 | 64 | - | - | 78 | 70 | 85 | 76 |
| 60 | 5.6 | 141 | 126 | 108 | 96 | 130 | 115 | 118 | 105 | 128 | 114 |
| 80 | 7.4 | 188 | 168 | 143 | 128 | 210 | 185 | 157 | 140 | 170 | 152 |
| 100 | 9.3 | 235 | 210 | 179 | 160 | 280 | 250 | 196 | 175 | 213 | 190 |

[1] Radley target seeding rates were 55, 80 and 110 seeds/m$^2$

[2] Seeding rate (kg/ha) = (seeds/m$^2$ x grams per 1000 seeds) / % germination

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**Table 2. Optimum seeding rate and corresponding yield of field pea.**

| Leaf-type | Variety | Targeted Optimum Seeding Rate | | Yield (average of years tested) | |
|---|---|---|---|---|---|
| | | seeds/m$^2$ | seeds/ft$^2$ | kg/ha | lb/ac |
| Semi-leafless | Carneval | 60-80 | 5.6-7.4 | 4896 | 4367 |
| | Keoma | 80 | 7.4 | 4113 | 3669 |
| | Radley | 50 | 5.1 | 4267 | 3806 |
| Tare-leaf | Express | 60 | 5.6 | 4138 | 3691 |
| Normal-leaf | Grande | 60 | 5.6 | 4383 | 3910 |

Generally, seeding rate had no affect on seed weight. In one year, however, Express showed a decrease in seed weight with increasing seeding rate.

Given adequate space, moisture and nutrients, peas will compensate for low plant density through more branching and heavier pod set. Trial results indicate that tare-leaf and normal-leaf varieties better compensate for lower seeding rates (i.e. are more plastic) compared to semi-leafless varieties.

At lower plant densities, normal-leaf varieties have a competitive advantage against weeds because their leaves create more shade than semi-leafless varieties.

Higher seeding rates may be better for weed suppression but denser plant stands are also more susceptible to disease and lodging. Normal-leaf pea varieties are generally more prone to disease and lodging problems under irrigation compared to semi-leafless varieties. Seeding normal-leaf varieties at lower rates will help to avoid unhealthy overcrowding.

## Optimum Economic Return

Seed is a major input cost for pea production, especially large seeded varieties. The larger the seed, the more volume will be required per acre to reach a target plant stand. The optimum seeding rate in terms of economic return was calculated for Carneval (semi-leafless), Keoma (semi-leafless) and Grande (normal-leaf) (Figure 1). A seed cost of $5.50/bu ($202/tonne) and a market price of $3.75/bu ($138/tonne) were used for these calculations. Optimum returns (gross revenue minus seed cost) were realized at 70 seeds/m$^2$ (6.5 seeds/ft$^2$) for Carneval, 80 seeds/m$^2$ (7.4 seeds/ft$^2$) for Keoma and 60 seeds/m$^2$ (5.6 seeds/ft$^2$) for Grande.

Because yields are much higher under irrigation, the cost of seed is a smaller percentage of gross revenue compared to dryland production. Therefore, the economic optimum is essentially the same as the yield optimum.


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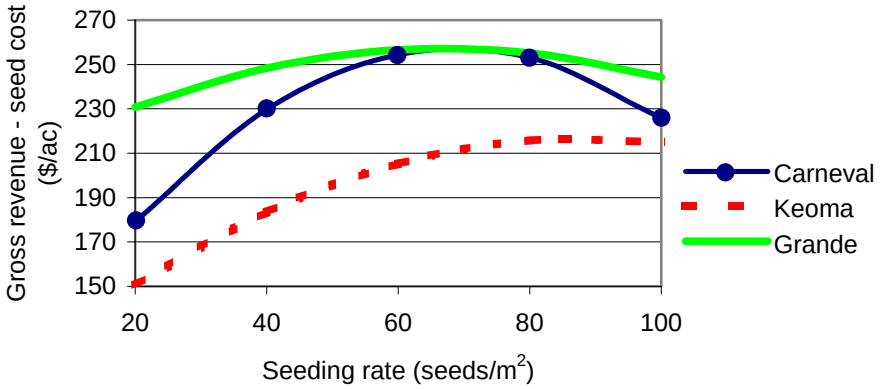


*Figure 1. Economic return in response to seeding rate.*

**The Bottom Line...**

Yields optimized at 60 seeds/m$^2$ (5.6 seeds/ft$^2$) for the tare- and normal-leaf varieties and around 80 seeds/m$^2$ (7.4 seeds/ft$^2$) for the semi-leafless varieties (with the exception of Radley).


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