The Effects of Irrigation, Cultivars and Mulch Type on Nutrient Availability and Vegetative Growth of Seabuckthorn

Carl Boivin, Hélène Rousseau, Jacques-André Rioux and Daniel Bergeron

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Introduction

- Has 'introduced plant' status in Canada
- First orchards in Quebec: late '90s
- Main cultivar: 'Indian Summer'
- Few studies
- Master's projet (2004-2006)

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Introduction

Upon the establishment of a seabuckthorn orchard

- Weak competitiveness against surrounding vegetation (Levandovsky, 2003)
- Little drought tolerance
- No registered herbicides available for seabuckthorn plantings

Introduction

Mulches are effective in:

- The fight against weeks (Carter et Johnson, 1988; Skroch et al., 1992; Hembry et Davies, 1994)
- Limiting evaporative losses and maintaining uniform soil moisture (Borland, 1990)

Introduction

- Under commercial production conditions, seabuckthorn growth is enhanced by good water availability (Singh, 2003)
- At field capacity
  - Nutrient availability is heightened
  - N mineralisation is enhanced (Halvorson, 2002)

Objectives

- Assess the effects of irrigation, cultivar and mulch type on:
  - Soil nutrient levels
  - Mineral nutrition
  - Vegetative growth

Materials and Methods

Cultivars

- German

  - 'Askola' and 'Hergo'

- Latvian

  - 'Golden Rain', 'Mary', 'Sunny' and 'Tatjana'

Materials and Methods

Irrigation

- Two matric potential thresholds for irrigation treatments
  - 25 and 60 kPa
  - Monitored by tensiometer
  - Drip irrigation system

Materials and Methods

Mulch

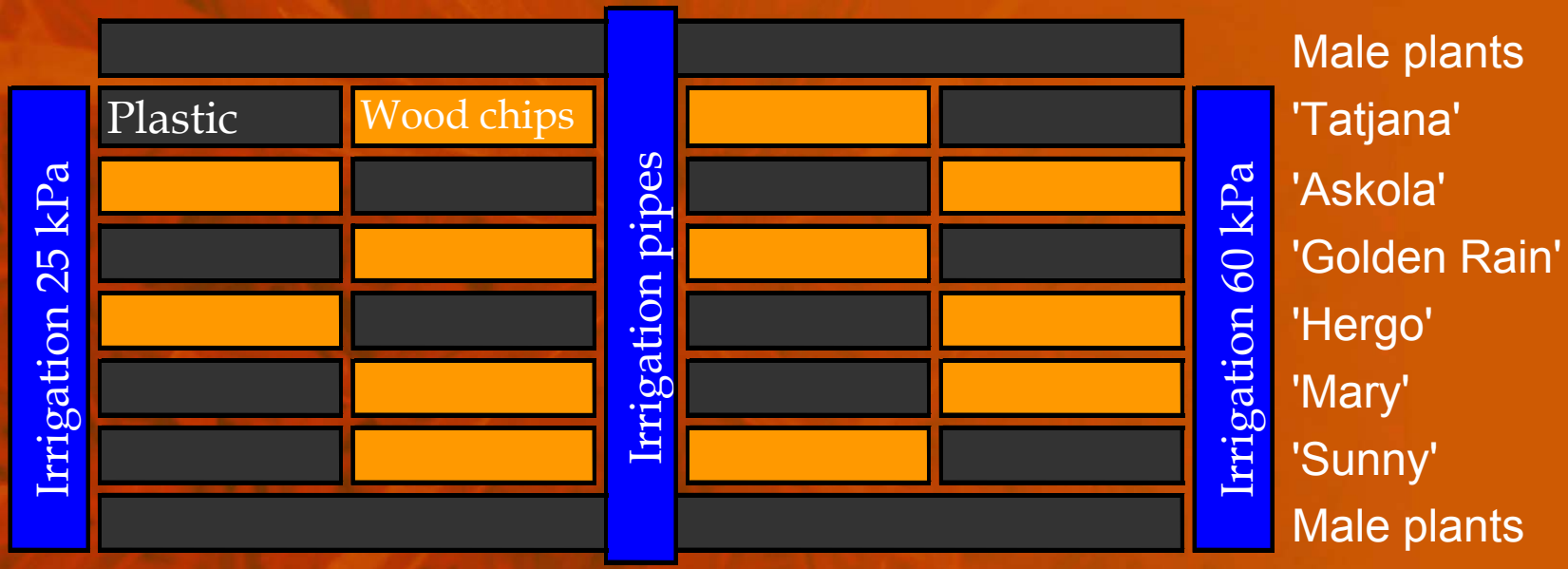
- Black plastic
  - Forestry type
- Ramial chipped wood
  - Wood from pruning
  - 15 cm thick

Materials and Methods

- Established in 2003 (720 plants)
- Maurice et Philippe Vaillancourt Farm
- Île d'Orléans, Quebec, Canada (47° N, 71° W)
- Sandy clay loam, pH 7,1 and O.M. 5,4 %

Materials and Methods

Strip-split-split-plot



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Materials and Methods

- Analyses
  - Soil, at two week intervals
    (NH_4, NO_3, P, K, Mg and Ca)
  - Leaves, twice per season
    (N, P, K, Mg and Ca)
- Vegetative growth
  - Trunk diameter
  - Plant height

Results and Discussion

Nutrient availability

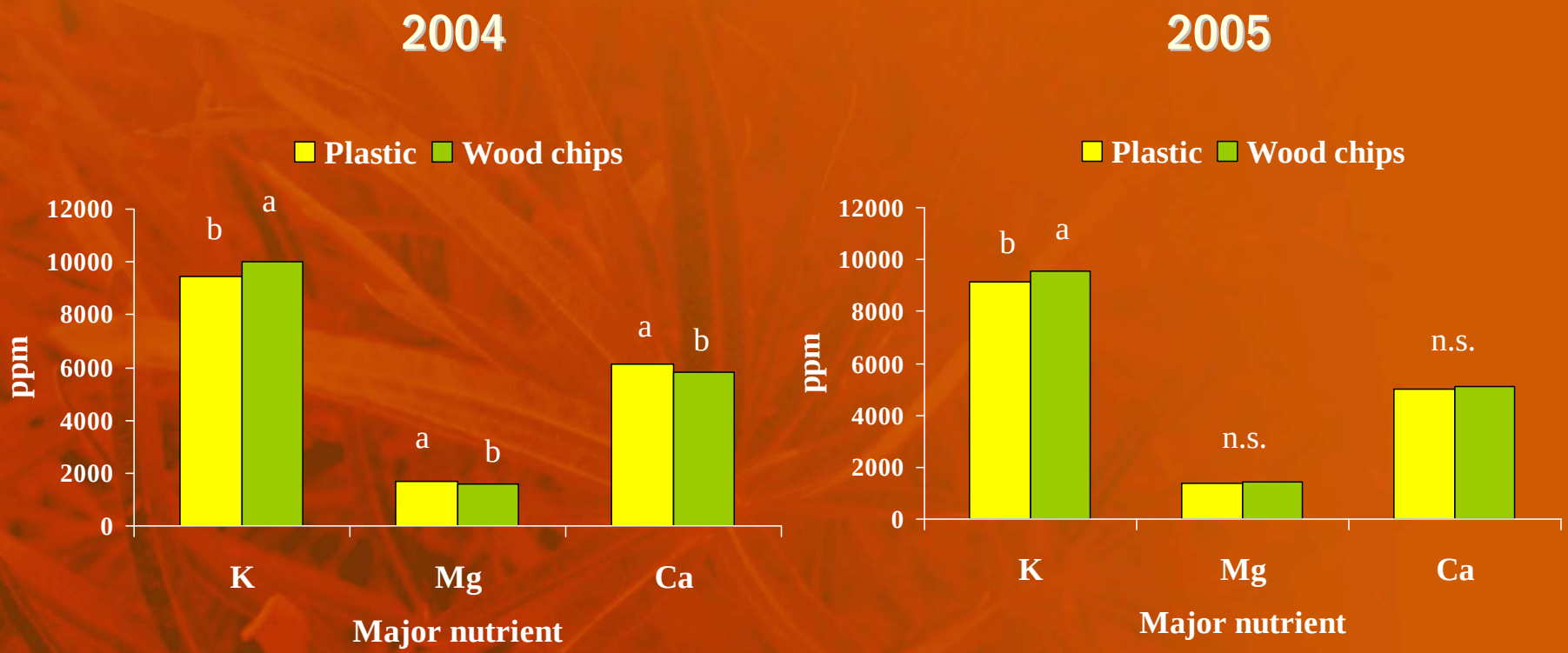
Levels of major soil nutrients (mg/kg) according to mulch type (2004)

Mulch	NH_4	NO_3	K
Plastic	0.27	7.82	191
Wood chips	0.43	2.67	277
F value	***	***	***

*** $P \leq 0{,}001$

Results and Discussion

Mineral nutrition



Levels (dry weight basis) of K, Mg et Ca in leaves according to mulch type (2004 and 2005)

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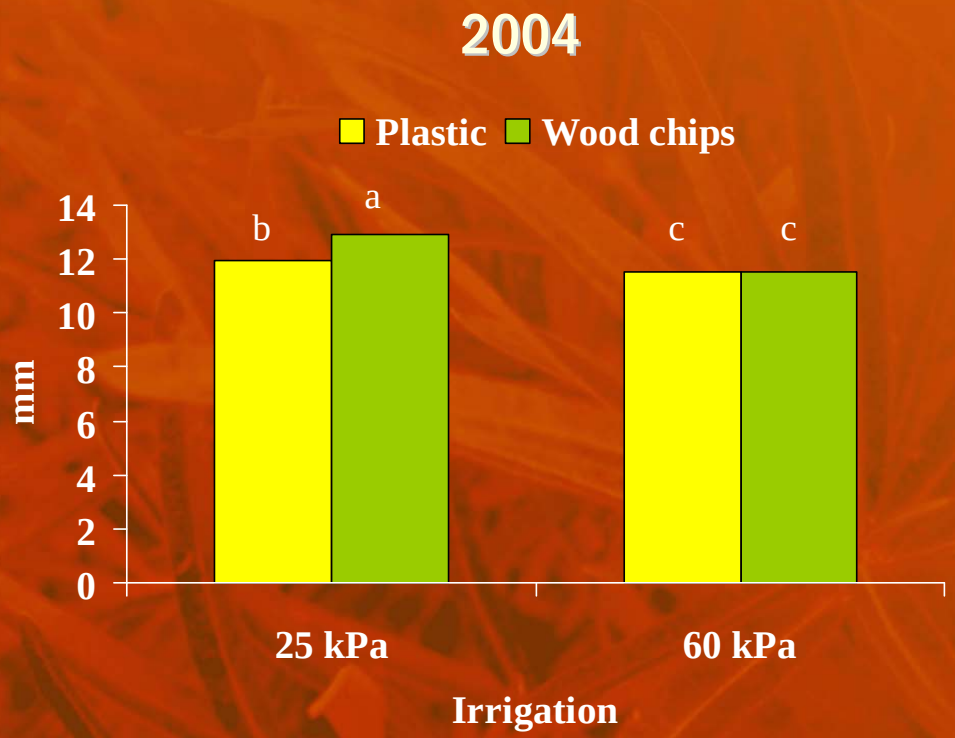
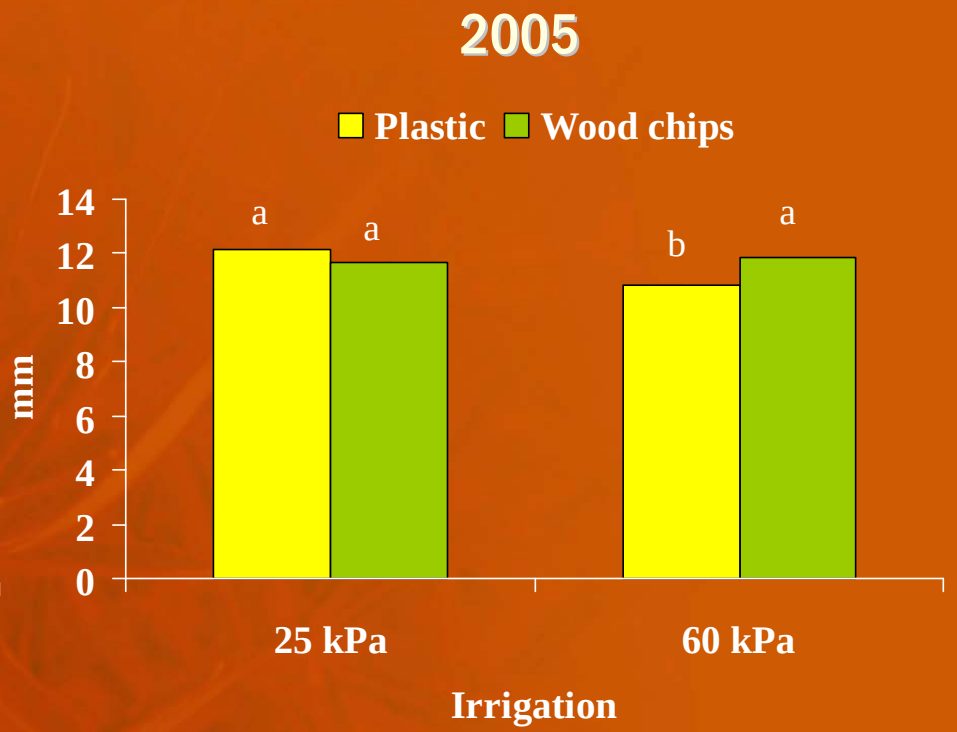
Results and Discussion

Increase in trunk diameter





Increase in seabuckthorn trunk diameter (mm) according to irrigation regime and mulch type (2004 and 2005)

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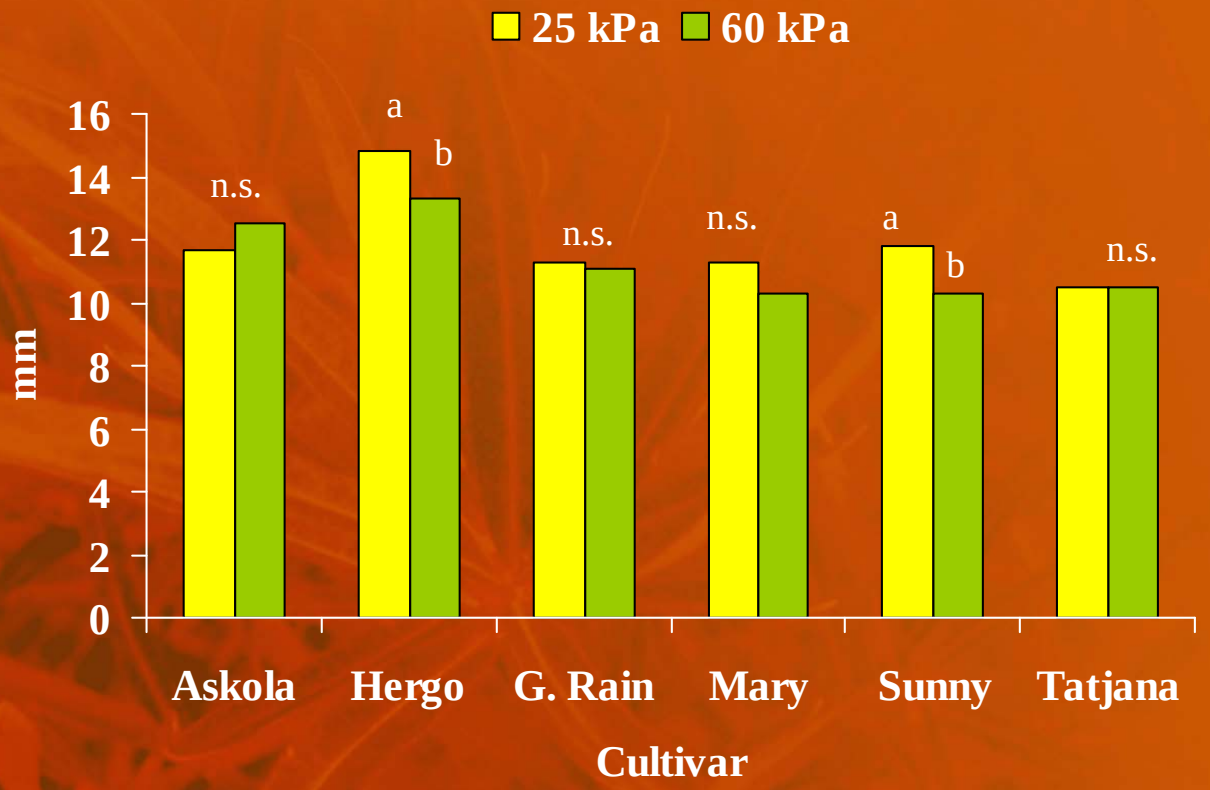
Results and Discussion

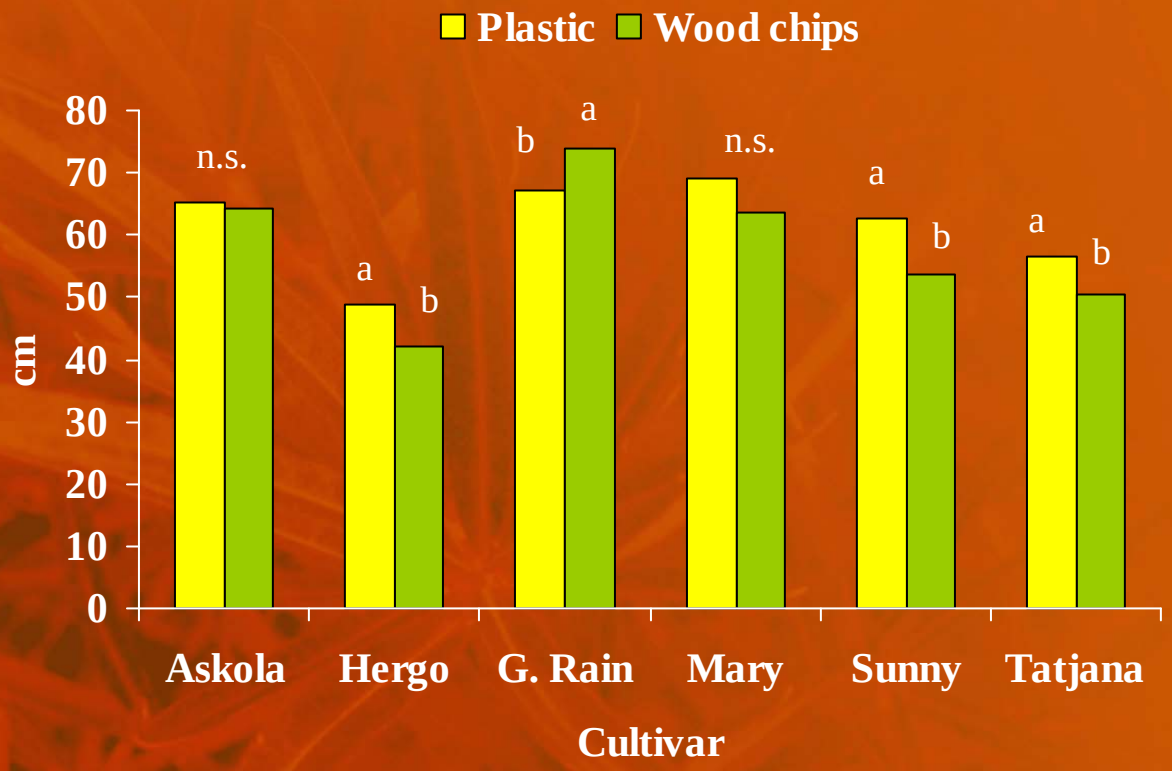
Increase in trunk diameter



Increase in seabuckthorn trunk diameter (mm) according to irrigation regime and cultivar (2005)

Results and Discussion

Increase in height



Increase in seabuckthorn height (cm) according to mulch type and cultivar (2004)

Results and Discussion

Increase in height

Increase in seabuckthorn height (cm) according to mulch type (2004 and 2005)

Mulch	2004	2005
Plastic	61.6	57.5
Wood chips	58.0	61.9
F value	**	***

** $P \leq 0{,}01$

*** $P \leq 0{,}001$

Conclusion

- The irrigation regime's impact was mainly limited to vegetative growth
- Mulch type influenced mineral nutrition and vegetative growth
- Cultivar response varied according to mulch type
- The effect of mulch type varied according to weather conditions
- Impacts on fruit production?

Acknowledgments

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