

RESPONSE OF POTATO TO SIMULATED HAIL DAMAGE IN THE FIELD

Samuel YC Essah¹ and Mark Zarnstorff²

¹Colorado State University, Dept. of Horticulture & Landscape Architecture; San Luis Valley Research Center, Center, Colorado. ²National Crop Insurance Services, 8900 Indian Creek Parkway Suite 600, Overland Park, Kansas.

Corresponding Author E-Mail: Samuel.Essah@colostate.edu

INTRODUCTION

Hail damage and the intensity of damage can be a concern for potato growers (Irigoyen et al. 2011).

Hail damage can occur at different growth stages of the potato (*Solanum tuberosum* L.) crop. Insurance against yield and quality losses caused by hail damage is important for grower risk management because in some cases the intensity of damage can cause economic loss to the grower.

The response of potato crop to hail damage depends on the cultivar (Irigoyen et. al. 2011), intensity of damage (Kolodziejczyk 2012), and growth stage of the crop (at tuber initiation, early tuber bulking, late tuber bulking) (Irigoyen et. al. 2011).

Effective crop insurance requires accurate data on yield and quality loss due to hail damage, so that producers can be properly reimbursed.

STUDY OBJECTIVE

The objective of this study was to evaluate the impact of simulated hail damage at three potato growth stages, and at three intensities of damage, on tuber yield and quality losses of early and medium to late maturity potato varieties.

MATERIALS AND METHODS

Experimental Site: The field study was conducted at Colorado State University San Luis Valley Research Center, on a gravelly sandy loam soil.



Experimental Design and Treatments: The study was laid out as a factorial arrangement of treatments in a randomized complete block design. Treatments included the following:



Treatments:

1. Control (No defoliation)
2. 33% defoliation at tuber initiation (TI 33%)
3. 66% defoliation at tuber initiation (TI 66%)
4. 99% defoliation at tuber initiation (TI 99%)
5. 33% defoliation at early tuber bulking (EB 33%)
6. 66% defoliation at early tuber bulking (EB 66%)
7. 99% defoliation at early tuber bulking (EB 99%)
8. 33% defoliation at late tuber bulking (LB 33%)
9. 66% defoliation at late tuber bulking (LB 66%)
10. 99% defoliation at late tuber bulking (LB 99%)

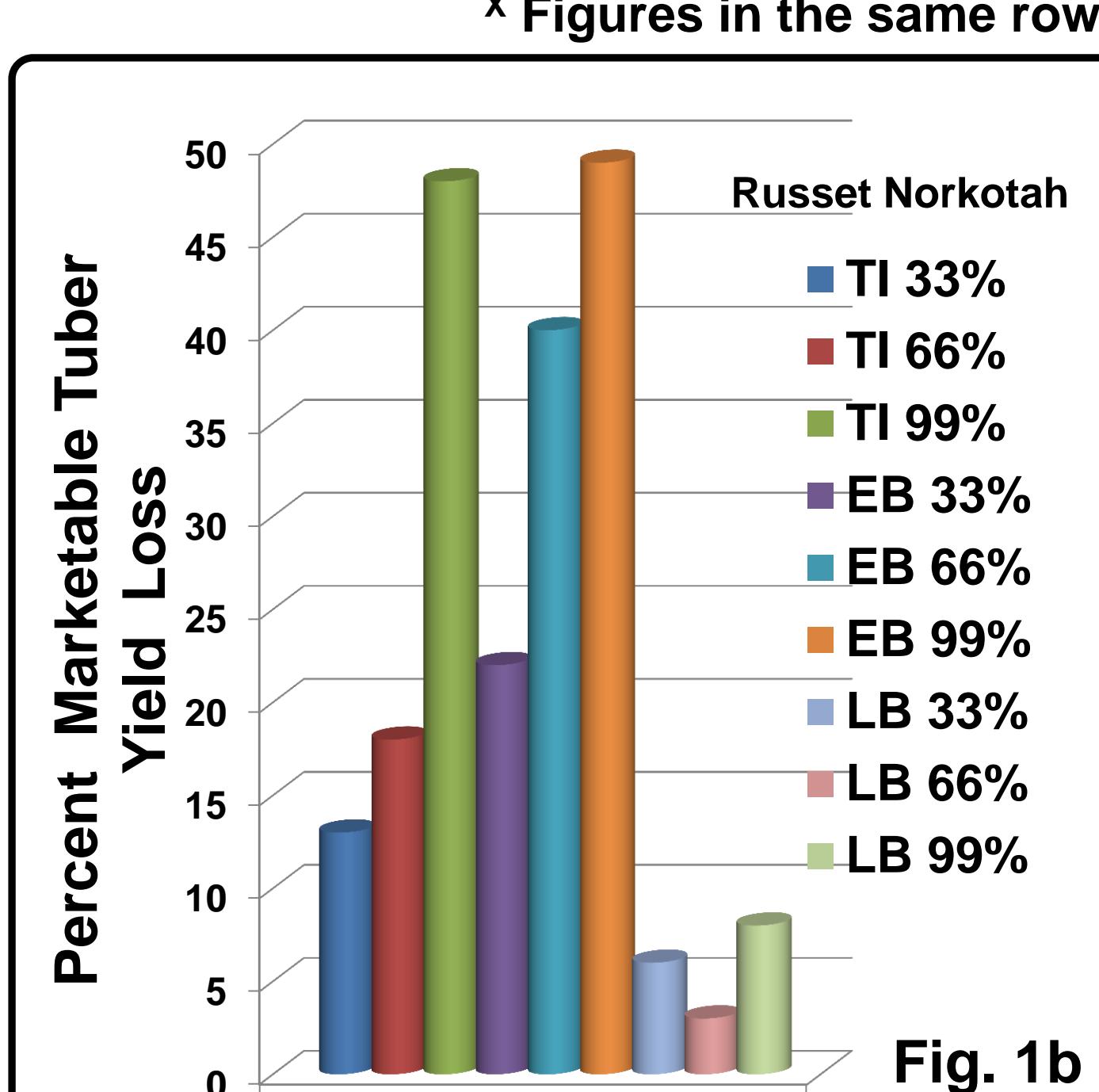
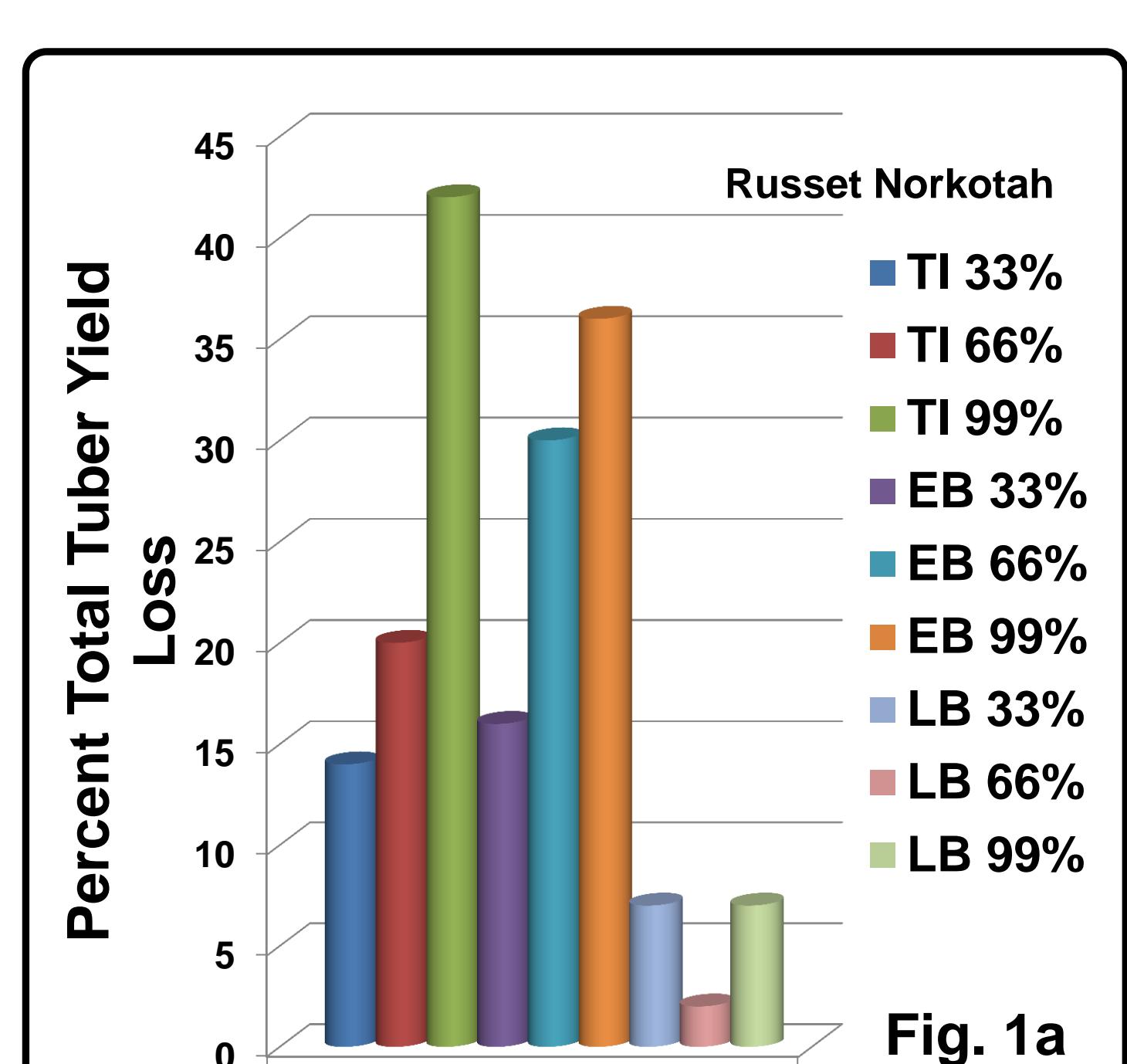
RESULTS AND DISCUSSION

RUSSET NORKOTAH (Early Variety)

Percent Tuber Yield Loss:

Total and marketable tuber yields of Russet Norkotah were significantly reduced when simulated hail damage occurred at tuber initiation, with 99% foliar damage, and at early tuber bulking, with 66% and 99% foliar damage (fig. 1a and b).

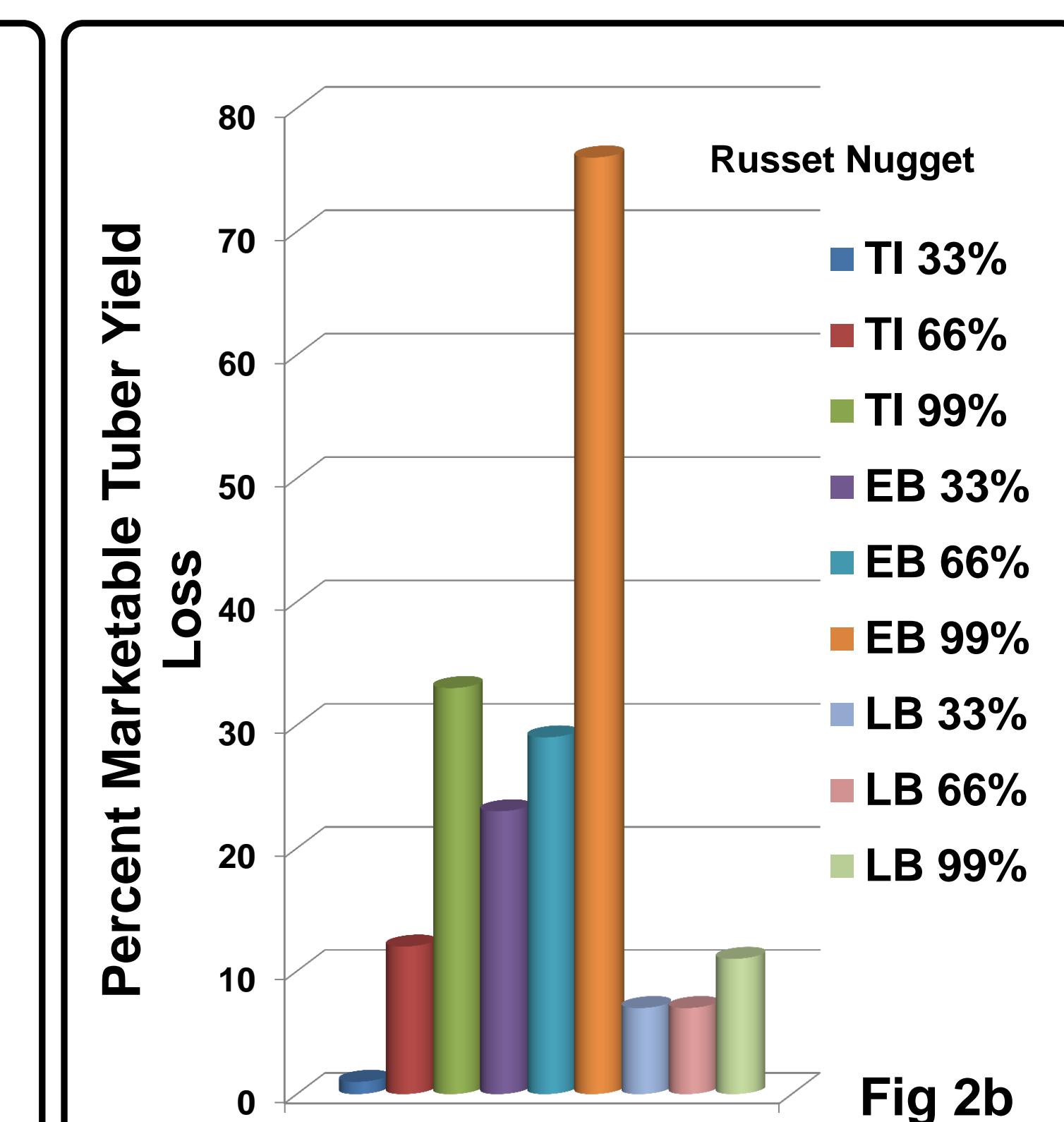
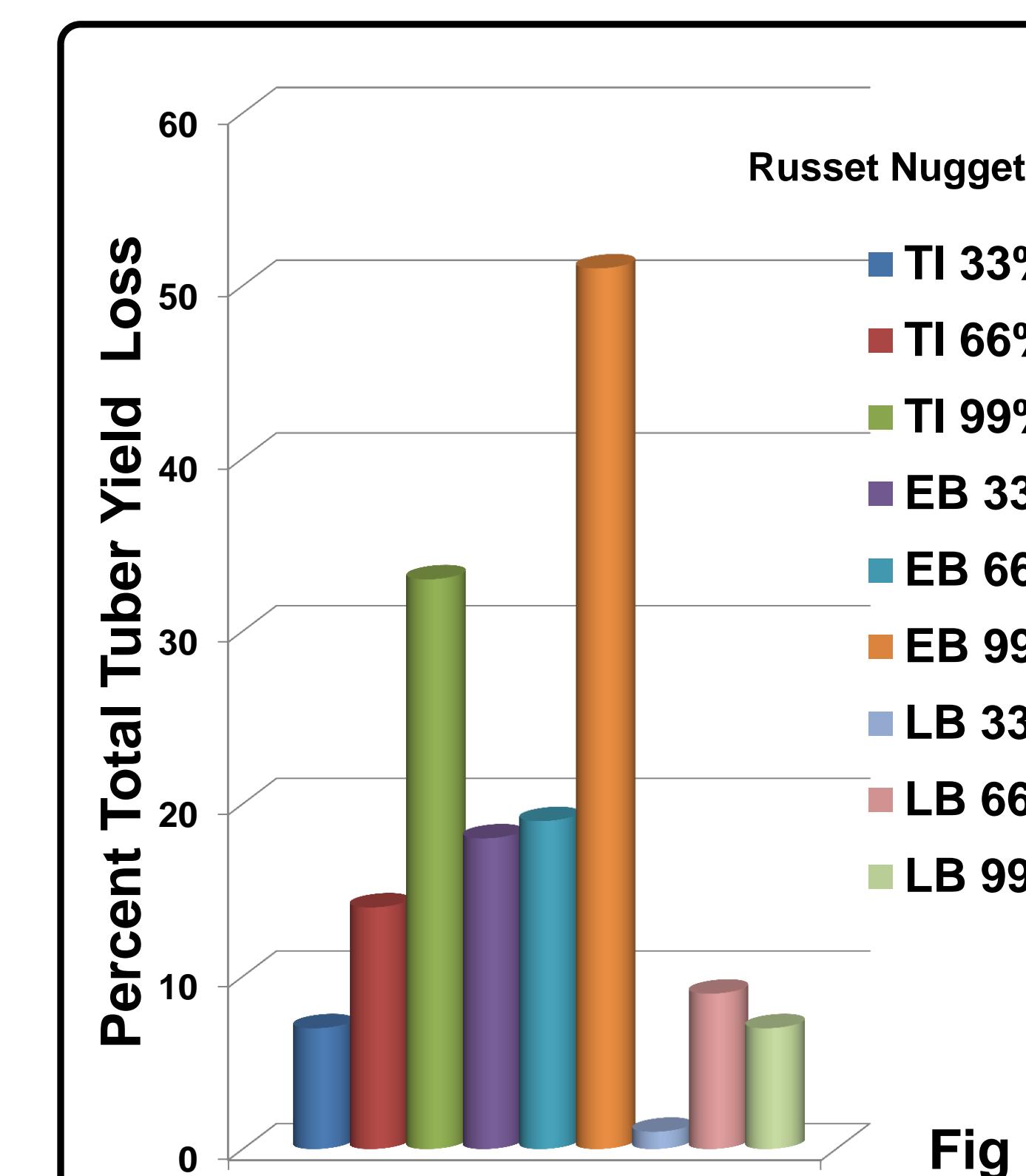
Simulated hail damage during late tuber bulking did not significantly reduce total or marketable tuber yield at any of the intensities of foliar damage (fig. 1a and b).



RUSSET NUGGET (Medium to Late Variety)

Percent Tuber Yield Loss:

Total and marketable tuber yields of Russet Nugget were significantly impacted when simulated hail damage occurred at early tuber bulking with 99% foliar damage (51% and 71% yield reductions, respectively) (fig. 2a and b). Simulated hail damage at tuber initiation, with 99% foliar damage also reduced total and marketable tuber yields (33% yield reductions). Yield reductions caused by simulated hail damage at late tuber bulking, or at early tuber bulking with 33% foliar damage were found to be significantly low (fig. 2a and b).



Tuber Specific Gravity:

Tuber specific gravity is a quality trait that is very important to the processing industry, as well as the fresh market. It is a measure of the dry matter content or solids in the tuber. Tuber specific gravity was significantly reduced (1.074 and 1.080 for Russet Norkotah and Russet Nugget, respectively) when simulated hail damage occurred at early tuber bulking with 99% foliar damage (Table 1).

Table 1. Response of tuber specific gravity of two potato varieties to simulated hail damage in the field

VARIETY/TREATMENT	Control	TI 33%	TI 66%	TI 99%	EB 33%	EB 66%	EB 99%	LB 33%	LB 66%	LB 99%
Russet Norkotah	1.091 a ^x	1.092 a	1.091 a	1.090 a	1.087 ab	1.082 abc	1.074 c	1.078 bc	1.088 ab	1.093 a
Russet Nugget	1.108 ab	1.110 a	1.110 a	1.107 ab	1.105 bc	1.102 cd	1.080 f	1.101 cde	1.099 de	1.097 e

^x Figures in the same row and bearing the same letters are not significantly different at the 0.05 level of probability

SUMMARY

Data from this study indicate that:

1. Hail damage at tuber initiation and at early tuber bulking, with 99% foliar damage can cause maximum economic loss to the grower.
2. Hail damage at late tuber bulking, irrespective of intensity of foliar damage, does not impact yield loss significantly.
3. Tuber specific gravity can be reduced significantly if hail damage occurred at early tuber bulking, with 99% foliar damage.

LITERATURE CITED

1. Irigoyen, I., I. Domeno, and J. Muro. 2011. Effect of defoliation by simulated hail damage on yield of potato cultivars with different maturity performed in Spain. *Am. J. Pot. Res.* 88:82-90
2. Kolodziejczyk, M. 2012. Effect of the degree and timing of the simulated reduction of plants assimilation area on the yielding of potato. *Fragmenta Agronomica* 29:81-87.