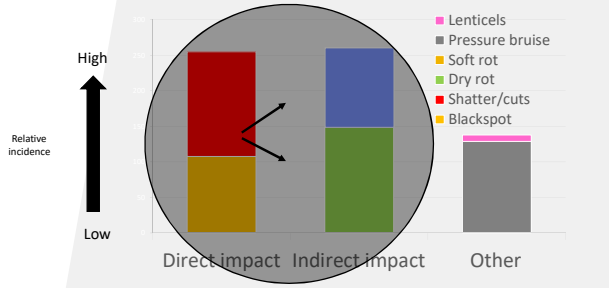
University of Idaho

EVERYBODY LOSES FROM POTATO BRUISES

NORA OLSEN AND MIKE THORNTON

QUALITY LOSS ASSOCIATED WITH IMPACT DAMAGE



It takes some kind of impact force to cause most types of bruising. The bigger the potato and the larger the drop – the more bruising that results

There are two ways to reduce drops –
1. Physically modify the drop (works best for equipment that has a pivot point like booms and stingers)

There are two ways to reduce drops –
2. Run the equipment at capacity so that potatoes fall onto other potatoes, and not bare metal

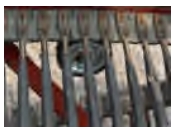
What if we can't modify the drop?
- Use cushioning to reduce impact force and resulting bruise damage. Belting, foam pads, and soil are all effective cushioning materials


Watch for wear on harvesting and handling equipment

- Replace worn parts, belting, padding and flights





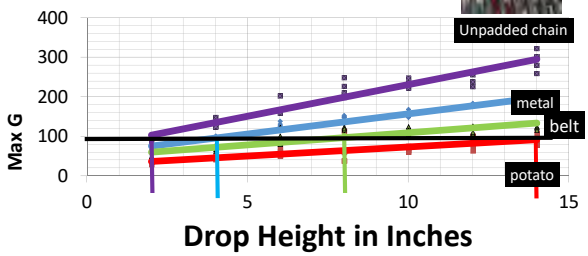



Multiple devices on the market

- IRD™-(Impact recording device) by Techmark
- Smart Spud ®
- Mikras
- TuberLog®
- Others




Impacts from varying height onto different materials



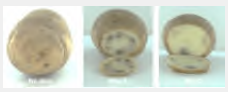


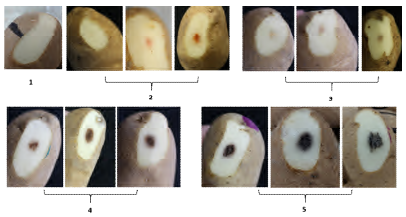
HOW QUICKLY WILL A BRUISE SHOW

Shatter- <u>Instantly</u> – visual or use iodine dye

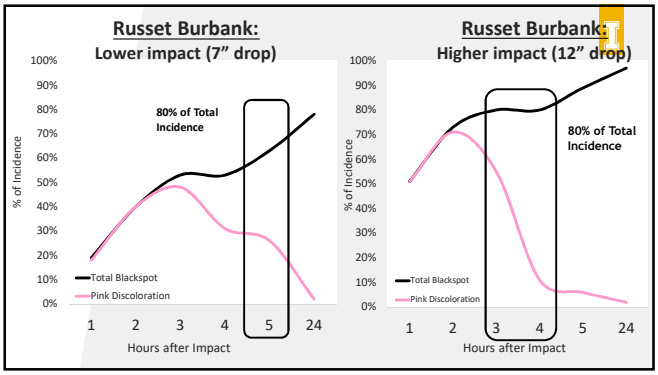
Blackspot bruise – takes <u>time</u> to develop

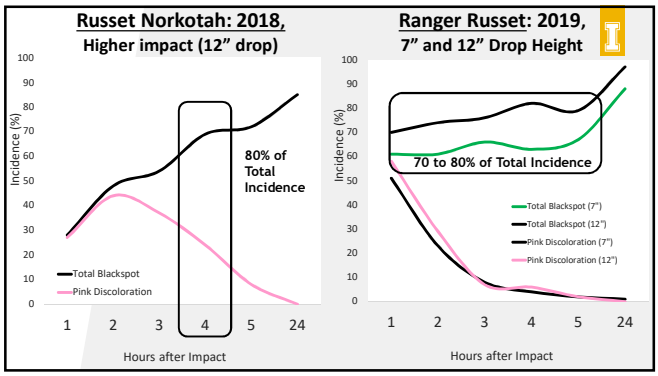
- Warmer temperatures will speed up process
- Need to know to make harvest/handling equipment adjustments
- Are bruises showing up between storage unloading and processing/packing (eg. fresh bruise)?
- Will the bruise become a scorable bruise
  - 5% pare away for fresh

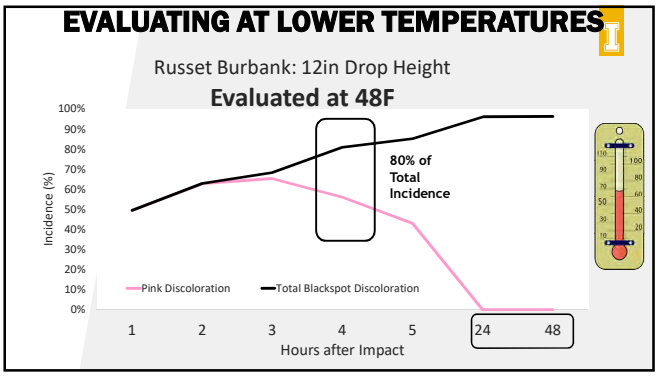


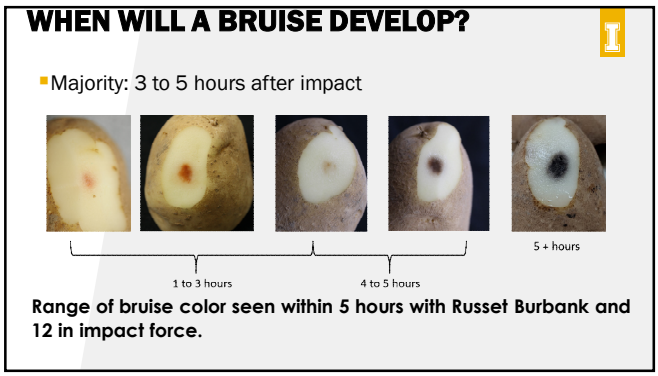


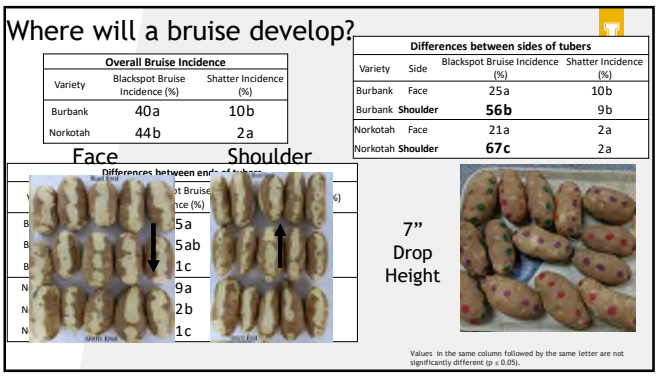
- Two uniform bruises on bud and stem end
- Bruised using a 100g impact device
- Held at 70F or 48F until evaluated



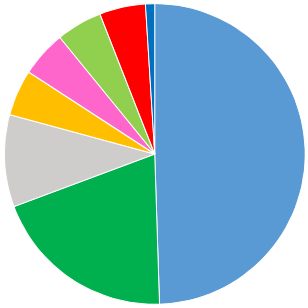




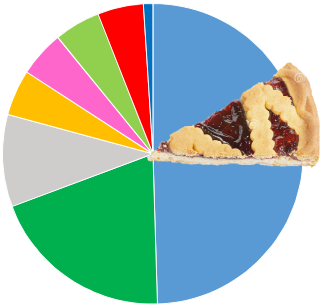




Tuber contribution to bruise



Tuber contribution to bruise

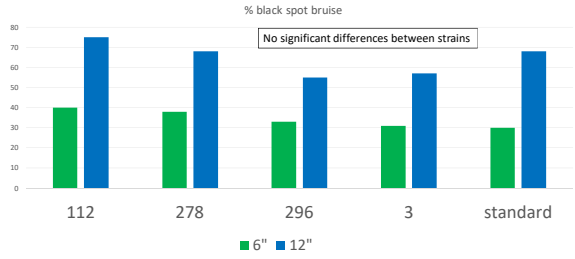


Biggest pieces of pie:

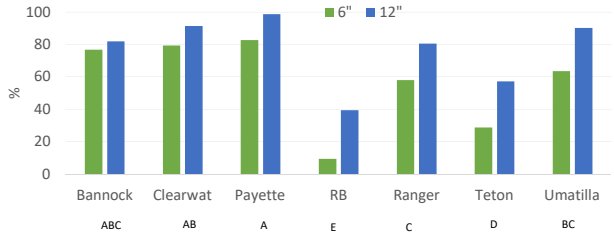
- **Variety**
- **Drop height/impact**
- **Pulp temperature**

Variety

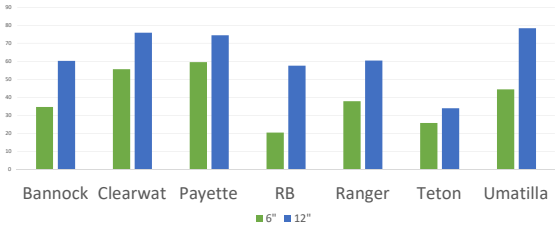
Black spot incidence on Norkotah strains at Harvest - 6 or 12” Drop



Black spot incidence on varieties at harvest - 6 or 12” Drop



Shatter bruise incidence on varieties at harvest - 6 or 12” Drop



Variety and Drop Height: 3in, 7in, 12in

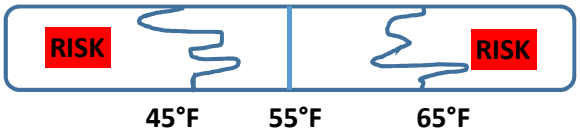
Height (in)	Variety	Blackspot Bruise Rating (1 to 4)	Shatter Incidence (%)	Blackspot Bruise Incidence (%)
3	Teton	1.4a	1a	40a
7	Teton	2.0b	11b	80c
12	Teton	2.7c	29c	95d
3	Umatilla	1.9b	3a	67b
7	Umatilla	2.6c	15b	86cd
12	Umatilla	2.9d	25c	92d
3	Clearwater	2.1a	1ab	90ab
7	Clearwater	2.8b	12c	98c
12	Clearwater	3.4c	29d	98c
3	Dakota	2.1a	0a	89a
7	Dakota	2.8b	2ab	96bc
12	Dakota	3.5c	7bc	99c

Variety and impact

- Depending upon variety and force can alter
  - Shatter bruise up to 30%
  - Blackspot bruise up to 45%

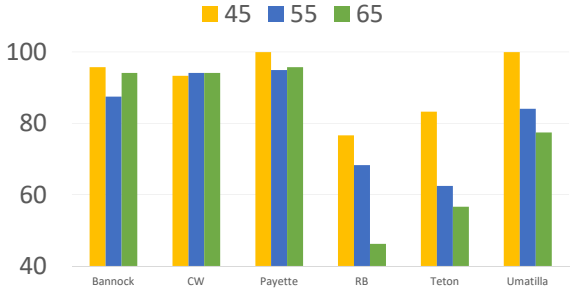
Temperature and variety

Risk when harvest outside ideal range

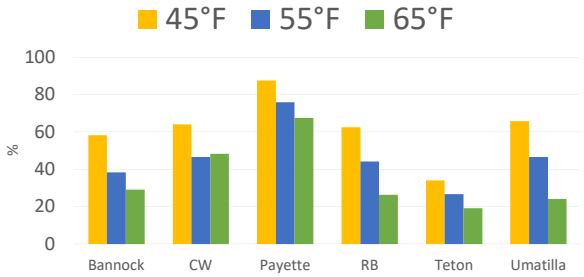


1/31/2020

Blackspot Bruise Incidence (%)



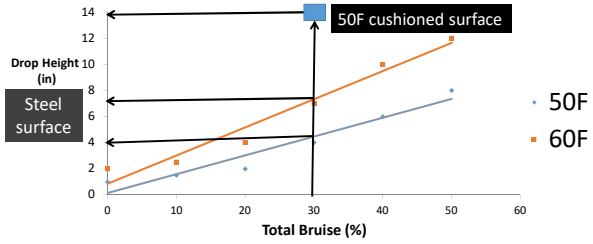
Shatter Bruise Incidence (%)



Variety and temperature

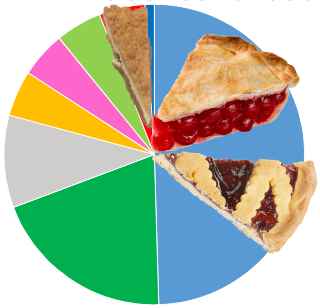
- Depending upon variety can alter
  - Shatter bruise up to 40%
  - Blackspot bruise up to 30%

Impact of temperature and drop height on bruise incidence



Source: Hyde, Bajema and Thornton, 1993

Tuber contribution to bruise



Biggest pieces of pie:

- **Variety**
- **Drop height/impact**
- **Pulp temperature**

Other pieces being investigated:

- **Season**
- **Soil moisture at harvest**
- **Maturity and age**
- **Fertility (N, K, Ca)**
- **Fungicide programs**
- **Tyrosine content**

Influence of Post-Vine-Kill Irrigation on Blackspot Bruise

Irrigation treatment	Blackspot Bruise (%)
No irrigation	46
4 days before harvest	24
8 days before harvest	10
Continuously >65% ASM	11

1. Soil moisture at 50% at vine kill. 3 weeks until harvest
2. No effect of irrigation if soil moisture kept at 65% or above after vine kill.

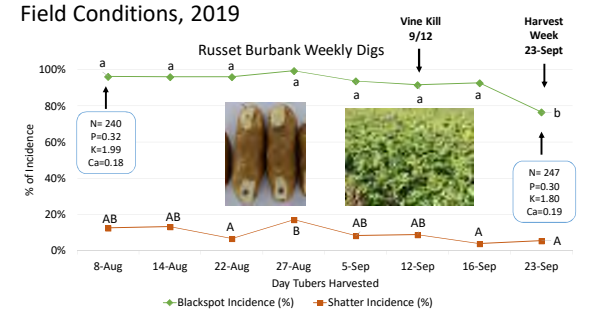
Source: Stark, 1987

Soil moisture from vine kill to harvest (Russet Burbank; 3 weeks)

2018	% Blackspot	Blackspot depth (mm)	% Shatter	2019	% Blackspot	Blackspot depth (mm)	% Shatter
No irrigation	53	2.8	31	No irrigation	100	5.7	24
Irrigated to ~75% ASM	58	3.0	40	Irrigated to ~75% ASM	100	5.7	21
Irrigated 1 week prior to harvest	62	3.2	30	Irrigated 1 week prior to harvest	100	5.6	19

Measure hydration,

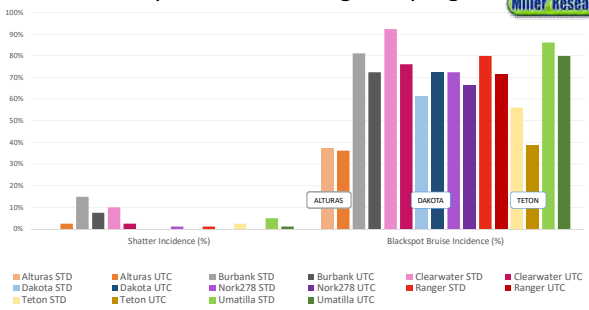
Field Conditions, 2019



7in Drop Height

Values followed by the same letter are not significantly different ($p \leq 0.05$) for blackspot incidence (lowercase) and shatter incidence (uppercase).

Variety and in-field fungicide program



Field phosphorous acid applications and bruise- Russet Burbank, 55F bruise, 7" drop, 2019

Treatment	Shatter (%)	Blackspot (%)	Blackspot rating
Untreated	1	57	1.7
Phos acid 1	1	64	1.8
Phos acid 2	2	51*	1.6
Phos acid 3	2	54	1.7
Phos acid 4	2	66	1.8
Phos acid 5	0	61	1.8
Phos acid 6	1	65	1.8
Mefenoxam	0	67*	1.8

Russet Burbank Fertility Trials, 2019

Treatment	Blackspot Incidence %	Rating (1 to 4)	Depth (mm)	Shatter Incidence (%)
100% N	84 a	2.5 b	5.2 b	9 a
75% N	79 a	2.3 a	4.6 a	6 a

Treatment	Blackspot Incidence %	Rating (1 to 4)	Depth (mm)	Shatter Incidence (%)
Standard N program	86 a	2.3 a	4.4 a	6 a
85% N program	86 a	2.4 a	4.5 a	6 a
115% N program	92 a	2.4 a	4.8 a	7 a

Values followed in the same column by the same letter are not significantly different ($p \leq 0.05$)

Minimize Impact, Lessen Susceptibility, Decrease Bruise

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-Videos
  -Windrow and Harvester operation
-Stickers for equipment
-*In English and Spanish*