AGRICULTURAL RESEARCH FOUNDATION
FINAL REPORT
FUNDING CYCLE 2015 – 2017

TITLE: Can Pumpkins be Grown Competitively for Snack Seed Purposes in Malheur County?

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SUMMARY: Pumpkins (*Cucurbita pepo)* grown for their seed for use as a snack product appears to be a growing market. Seeds derived from pumpkin production are a healthy and popular food option (Rubatzky & Yamaguchi, 1999). Recently, greater attention has been placed on the emerging market of ready-to-eat (RTE) snacks such as dried and seasoned pumpkin seeds (Brennan, et.al, 2012). This trend is expected to continue grow for at least the next five years. Conversations in the spring of 2014 with Oregon Department of Agriculture Trade Specialists indicated that Oregon may be positioned to help supply an increasing need for pumpkin seeds for companies that would alleviate the need to import their supplies from overseas.

OBJECTIVES: The hypothesis of this proposal is that varieties currently available for pumpkin seed production could be produced competitively in Malheur County providing another crop alternative for producers while filling a need for product in an emerging market.

PROCEDURES:

2015

A replicated cultivar nursery was planted at the Malheur Experiment Station, Ontario, OR on 25 May. Plot size was three rows by 30 feet long. The rows were spaced five feet apart. Plants were spaced 12" in-row. The trial was drip-irrigated. Watermark granular data metric sensors were placed in the field to aid in irrigation scheduling. It should be noted that there is no available data for pumpkin irrigation scheduling based on watermark sensor data. The plots were monitored for general plant health, insect activity, and disease incidence. Stand emergence (early) and a plant health rating (mid-to-late season) were taken at weekly intervals.

Harvest consisted of knocking the pumpkins off the vine on 26 September. The harvested plot size was 5' by 10' and was determined by dropping a PVC pipe square in the middle of the plot and all pumpkins were taken that fell inside the box. They were weighed, measured and the seed were removed on 6 October. At harvest, a final count of pumpkins per plot was taken. A subsample of ten pumpkins per plant was then taken to determine individual size and weight. After the manual removal of seed, the seed were weighed wet, and then dried in a forced air dryer and then weighed. This allowed the calculation of weight loss along each step to provide a value of dried, cleaned pumpkin seed per pumpkin.

2016

A cultivar nursery with eight replicated and three non-replicated cultivars was planted at the Malheur Experiment Station, Ontario, OR on 13 June, 2016. Plot size was two rows by 20 feet long. The rows were spaced five feet apart. Plants were spaced 12" in-row. The soil pH was 7.3 and organic matter was 2.12%. The trial was drip-irrigated. Watermark granular data metric sensors were placed in the field to aid in irrigation scheduling. It should be noted that there is no available data for pumpkin irrigation scheduling based on watermark sensor data. These were used only to monitor the drying trend of the soil. Plots were monitored for general plant health, insect activity, and disease incidence. Stand emergence (early) was taken at weekly intervals for the first three weeks. The trial was hand-weeded. The nursery was sprayed with Gladiator at 19 oz/ac once for squash bug control.

Harvest consisted of knocking the pumpkins off the vine on 6 October. Individual plants were collected. Pumpkins were weighed, counted, and the seed were removed on 18 October. After the manual removal of seed, the seed were weighed wet, and then dried in a forced air dryer and then weighed again. This allowed the calculation of weight loss along each step to provide a value of dried, cleaned seed per pumpkin. Seed quality ratings were based on the uniformity of color, size and shape of the seed after cleaning and drying.

SIGNIFICANT ACCOMPLISHMENTS TO DATE:

In 2015, cultivars varied widely in seed yield and seed quality (appearance). NH2020R was the highest yielding entry but was middle of the pack in visual rating (Table 1). NH 2019R yielded the poorest but had one of the best visual ratings. The long-established Lady Godiva yielded well and had good visual quality but was one of the lower yielding entries in terms of efficiency with only 2.6% of total weight recognized in dry seed. Both of the non-replicated rated very well in visual rating with RPX 5921 providing good yield. Both of the non-replicated cultivars were considered semi-bush with a plant that would be considered more upright and this may have led to good plant health rating as the season progressed (Table 2). The best plant health across the growing season in the replicated entries was the NH 2020R. With good plant health and the highest yield potential, the goal should be to determine how to improve its visual appearance to help make it a more viable option for producers.

Table 1. The yield results of replicated pumpkin cultivars grown at the Oregon State University Malheur Experiment Station, Ontario, OR in 2015.

Entry	Avg. number of pumpkins/plot	Avg. pumpkin diameter (in)	Percent weight as seed (dried)	Seed yield (lbs/ac)	Visual rating 1-5 (5=best)
HSC 209	8.8c	8.3a	3.4bc	1772.2bc	2.2
Styrian	10.8bc	8.1ab	2.0d	1147.8bc	2.1
Kakai	13.8bc	7.6ab	3.6bc	1971.1ab	2.8
Lady Godiva	16.0ab	7.2b	2.6cd	2056.0ab	3.6
NH2020R	21.5a	5.4c	7.2a	2848.8a	3.2
NH2019R	10.5bc	5.5c	4.2b	1006.2c	3.9
LSD	5.80	0.96	1.32	920.35	ns
F value	0.0065	0.0001	0.0001	0.0152	0.3064
Non-replicated					
RPX 5644	14	7.3	2.6	1463.6	4.0
RPX 5921	23	5.5	2.8	1803.4	4.0

Table 2. The plant health ratings (1-5(5=best)) of replicated pumpkin cultivars grown at the Oregon State University Malheur Experiment Station, Ontario, OR in 2015.

Entry	10-Aug	17-Aug	24-Aug	31-Aug	7-Sept	14-Sept	21-Sept	26-Sept
HSC 209	2.50b	2.38b	1.88c	1.88b	2.00	1.88	1.75	1.40
Styrian	4.00a	4.13a	3.63a	3.25a	2.63	2.38	1.63	1.40
Kakai	2.50b	3.13ab	2.75b	2.50ab	2.00	1.63	1.50	1.50
Lady Godiva	3.50ab	3.50ab	3.25ab	2.75ab	1.75	1.25	1.25	1.30
NH2020R	3.30ab	3.50ab	3.25ab	3.25a	2.75	2.75	2.25	2.00
NH2019R	2.75b	3.00ab	1.75c	2.00b	1.50	1.25	2.00	1.5
LSD	1.055	1.164	0.770	1.046	ns	ns	ns	ns
F value	0.0181	0.0365	0.0004	0.0338	0.3237	0.0777	0.3522	0.3753
Non-replicated								
RPX 5644	4.50	4.00	4.00	4.00	4.00	3.50	3.00	2.50
RPX 5921	4.50	4.50	4.00	4.00	3.50	3.00	3.00	3.00

In 2016, stand establishment failed with only 7% of the seed emerging after 14 days (Table 3). This shortfall made collecting reliable, replicated yield data impossible. The focus of the trial then turned to focusing on percent of pumpkin weight as dried seed and visual ratings. NH2026R had the highest percent weight of seed (Table 4) and was the highest rated in terms of visual ratings (Table 5). NH 2029R finished second in percent seed and in appearance. The long-established, industry standard Styrian yielded the lowest in percent seed weight and was middle-of-the-pack in terms of appearance. Better germination of all entries must be achieved

for this alternative crop to be viable in this growing region. Seed in 2016 was observed to be essentially "melting" or rotting in the soil with little or no sign of actual germination. The seed was sourced from several different areas making the stand establishment issue even more vexing. The 2015 pumpkin nursery trial produced a stand count of 35% with 2016 being even worse. In contrast, traditional hulled jack-o-lantern cultivars planted at the end of the field (protective borders) emerged strongly during both seasons.

Table 3. The stand count results of replicated pumpkin cultivars grown at the Oregon State University Malheur Experiment Station, Ontario, OR in 2016.

Replicated Cultivar	Percent Stand
HSC 209	1.3b
Styrian	20.0a
Kakai	1.9b
Naked Bear	4.4b
NH2028R	10.0ab
NH2026R	10.0ab
SQ 1810	3.1b
NH2029R	9.2b
lsd	10.30
P Value	0.0089
Non-repped	
NH2030	7.5
NH 2027	2.5
NH2019R	0.0

Table 4. The yield results of pumpkin cultivars grown at the Oregon State University Malheur Experiment Station, Ontario, OR in 2016.

Cultivar	Avg. number of pumpkins/plant	Avg. pumpkin weight (lbs)	Percent weight as seed (dried)
HSC 209	6.7	9.6	1.8
Styrian	6.1	7.8	1.7
Kakai	6.0	9.4	1.9
Naked Bear	17.5	2.1	4.7
NH2028R	11.3	2.7	3.6
NH2026R	12.5	2.0	6.4
SQ 1810	7.2	7.6	2.3
NH2029R	11.4	1.5	5.6
NH2030	13.0	1.5	6.5

Table 5. Visual ratings of pumpkin cultivars grown at the Oregon State University Malheur Experiment Station, Ontario, OR in 2016.

Cultivar	Visual rating 1-5 (5=best)	Comments
HSC 209	1.5	Lots of flats, pale
Styrian	2.5	Lots of flats and sprouts
Kakai	3.0	Sprout, varying size
Naked Bear	2.5	Cleaned & filled poorly
NH2028R	2.0	Varying color
NH2026R	4.5	Nice appearance, color
SQ 1810	1.5	Three different colors by maturity
NH2029R	4.0	Nice shape, uniform
NH2030	3.5	Uniform with some flats

BENEFITS & IMPACT: This work has proven valuable in identifying potential hurdles to pumpkins for seed production in the western Treasure Valley. There is great utility is learning what the impediments are to reduce the amount of grower error on a commercial scale. This project has helped create conversation on this crop as an alternative and it can be expected that exploration will continue.

Determining the best time to harvest these entries needs further determination. All of the cultivars showed a wide range of maturity in the plots both growing seasons. During harvest, it was common to observe sprouted seed in some pumpkins while others were immature enough to have their thin seed coatings rubbed off during the cleaning process. The cultivars tested all appear to be indeterminate and were flowering all the way up to harvest. This leaves producers with the difficult task of trying to determine the optimum window for taking the greatest number of marketable seed.

If pumpkins for seed production do prove viable, the next step will be to determine how the raw product will be washed, cleaned, and dried prior to marketing. It is believed that seeds need to be washed and dried within four hours of harvest before they will start to stick together and “brick-up” in their holding container. Seed are not considered marketable once they “brick-up”. The continuation of this project could eventually result in a new processing facility for pumpkin seeds being located in Malheur County that would further enhance the economic well-being by creating jobs.

A representative of the Snake River Economic Development Alliance has submitted samples from the 2015 trial to trade shows and the company SuperSeedz. This will give our region an opportunity to show our potential to possible markets.

ADDITIONAL FUNDING RECEIVED DURING PROJECT TERM: We have not realized other funding but we have received support in the form of seed and consulting to help support and guide this effort.

FUTURE FUNDING POSSIBILITIES: Specialty Crop Research Initiative (SCRI) funds could be pursued as the viability of this crop becomes apparent. This is still in the early "plausibility" stage but the early results exhibit a case for optimism if the emergence issues can be mitigated resulting in adequate crop establishment.