ORGANIC POTATO PRODUCTION AND STORAGE

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INTRODUCTION

The University of Idaho at the Kimberly Research and Extension Center located in south-central Idaho has an 11-acre certified organic field. This certification has prompted organic potato production research to compliment the on-going organic storage management research at the Kimberly Potato Storage Research Facility. The certified field is utilized to evaluate and grow various crops including potatoes under an organic system. The potato portion of the field had previously been planted to grain preceded by 3 years of alfalfa. The field also received 10 ton of compost prior to planting the crop in 2009. The objectives of the workshop presented at the 2010 Idaho Potato Conference was to highlight results from the second year of organic potato production trials at the University site. Two studies funded by the Idaho Potato Commission were conducted in 2009 and included a) a potato variety trial under an organic system and b) a trial evaluating the effects of pre- and in-season nitrogen sources on organic Russet Burbank production. A brief discussion on methods of sprout control in storage was also presented.

2009 ORGANIC POTATO PRODUCTION RESEARCH RESULTS

Organic potato variety trial

To evaluate how different varieties respond under an organic potato production system, certified seed of "Defender", "Alturas", "Russet Norkotah", "Russet Norkotah 3", "Yukon Gold", and "Dark Red Norland", "Yukon Gem", "Russet Burbank" , "Agata" and "Ampera" potatoes were planted April 20, 2009 in an ISDA Organic approved field at the University of Idaho Kimberly Research and Extension Center. The rate of emergence varied greatly between varieties and Defender, Agata, Norkotah exhibited rapid emergence compared to Ampera, Yukon Gold and Alturas (data not shown). There was a tremendous preference by Colorado Potato Beetles for Dark Red Norland, Ampera and Agata compared to the other varieties resulting in greater defoliation of those plots (data not shown). Defender and Alturas had green and vigorous vines near the end of the growing season indicating that these two varieties would be appropriate for an organic system with the potential of lower fertility conditions. The trial was harvested September 15, 2009. Defender, Yukon Gem, Russet Burbank and Agata yielded over 300 cwt/A under these organic conditions whereas Norkotah yielded 250 cwt/A (Table 1). There were significant differences between varieties in size profile (Table 1). Ampera produces an abundance of small sized (<4 oz) compared to the other yellow-skin/flesh varieties. Defender, Russet Burbank and Russet Norkotah had difficulties bulking under these

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Presented at the Idaho Potato Conference on January 20, 2010.

conditions and produced many tubers <4 oz. Processing quality for Russet Burbank, Defender and Alturas harvested tubers were acceptable for processing quality as indicated by specific gravity (1.082, 1.098 and 1.083 respectively) and fry color and sugar profiles (data not shown). External and internal visual evaluations for disease and disorders were made. Primary issues observed were black scurf and wireworm damage. Very little damage was evident and no significant differences between cultivars in disease and physiological disorders (data not shown).

Table 1. 2009 total yield, size profile, US #1 > 4oz. , culls, and yield of US#2 grade (cwt/A).

Variety	Total Yield (cwt/A)	US#1 (cwt/A)	US#2 (cwt/A)	>10 oz (cwt/A)	6-10 oz (cwt/A)	<4 oz (cwt/A)
Russet Burbank	299	203	35	10	58	96
Alturas	287	217	33	33	77	71
Defender	317	209	9	11	78	108
Dark Red Norland	283	237	8	15	120	46
Norkotah	249	161	5	5	58	88
Norkotah-3	286	240	10	27	126	45
Yukon Gold	258	231	11	65	109	27
Yukon Gem	320	276	8	66	127	44
Agata	362	300	5	45	157	61
Ampera	263	65	2	3	12	197

Nutrient Management for Organic Potato Production

Russet Burbank potatoes were planted into a certified organic field that after a spring barley cover crop. Dried distillers grains (DDGS) were incorporated to a 6-inch soil depth prior to planting at four rates (Table 2). Chilean nitrate was applied to selected plots at a rate of 48 lb total N/acre over three application events. Petiole nitrate concentrations trended higher for all Chilean nitrate treatments compared to treatments not receiving Chilean nitrate applications, however yields were only significantly increased when no distillers grains were added (Table 2). Fresh dairy manure was applied at a rate of 8.9 wet tons/acre prior to planting (Table 2), but did not significantly increase yields or petiole nitrate concentrations at the rates used in this study. Plant available nitrogen in the soil (12 inch depth) was significantly greater for the high DDGS treatment compared to low DDGS, medium DDGS, manure, and control treatments on 5/11/09, 6/1/09, 6/22/09, and 7/6/09 (data not shown). Plant available nitrogen was also significantly greater for the low DDGS, medium DDGS, and manure treatments in comparison to the control on 5/11/09 and 6/22/09 (data not shown). There was a trend ($p<0.10$) for lower glucose levels in tubers harvested from the 'high-distillers grains' plots compared to the control, fresh manure, Chilean nitrate alone, and low distillers with no Chilean nitrate plots. There were no significant differences between treatments related to fry color and quality and sucrose concentrations (data not shown). This difference in glucose content may indicate variability between treatments in terms of vine and tuber maturity at the time of

vine kill and harvest. The high distiller grain plots appeared greener later into the season compared to the other treatments. Utilization of DDGS may be an effective means to supply nitrogen to organically grown potatoes.

Table 2. Total yield, marketable yield, culls, and yield of US#2 grade (cwt/A). Values in the same column followed by the same letters are not significantly different at p≤ 0.05. *DDGS= Dried distillers grains.

	Pre-plant rate		***In-season***			***Petiole NO3 (ppm)***	
Preplant treatment	**ton dry matter/ acre**	**total lb N/acre**	**Chilean nitrate (total lb N/acre)**	**Total Yield (cwt/A)**	**US#1 (cwt/A)**	**7/14/09**	**7/27/09**
Dairy manure	3.1	54	0	296 ab	260 a	875 ab	1275 a
None	0	0	0	259 a	234 a	575 a	1575 ab
			48	331 bc	280 ab	3150 bc	5400 d
DDGS*	1.1	94	0	370 cd	328 c	950 ab	2250 abcd
			48	350 cd	322 bc	3375 c	5325 d
	1.6	134	0	376 cd	340 c	1425 abc	1800 abc
			48	370 cd	342 c	2925 bc	5025 cd
	2.0	173	0	380 d	353 c	2175 abc	2025 abc
			48	373 cd	342 c	3450 c	4650 bcd
LSD p≤ 0.05				46.4	47.5	2346	3278

ORGANIC STORAGE MANAGEMENT FOR SPROUT CONTROL

Sprout suppression strategies for organic potatoes depends upon the intended market of the potato, variety stored, and desired length of storage time. Sprout suppression options will also depend upon the storage building infrastructure and if organically approved sprout inhibitors can be successfully applied. Strategies for long-term storage of organic potatoes combine basic storage management decisions of utilizing temperature, humidity and airflow in combination with variety selection. Ideal conditions would include a long dormancy variety stored at cool storage temperatures (39-42°F) with the ability to humidify air to 90% or greater and provide fresh air.

Variety selection will depend upon the market use of the potato. Potatoes utilized for processing may not have the luxury of storing at cooler temperatures due to the unwanted increase in reducing sugar concentration. Although several new varieties, such as Premier Russet, can be stored at lower storage temperatures and still process well. Varieties can range in length of dormancy and will lengthen in time with cooler storage temperatures.

For example, Russet Burbank will break dormancy after 180 days when stored at 42°F compared to 130 days at 48°F. In comparison, Premier Russet has a dormancy length of 120 days at 42°F and 85 days at 48°F.

There is also the option of using an essential oil, such as clove oil, thermally applied to potatoes while in storage. Applications of clove oil should be made when sprouts are peeping and preferably no longer than ½ inch in length. Depending upon cultivar, not all eyes on a potato sprout at the same time so carefully watch the sprouting behavior and time the application accordingly. One benefit of using clove oil for sprout control in storage is the ability to capitalize on the inherent dormancy of the cultivar. Applications are not made until the potato actually begins to sprout which is dependent upon cultivar, storage temperature, and growing season.

Research results indicate clove oil rates between 50 to 100 ppm applied when sprout development occurs, or approximately at three to six week intervals, will provide adequate sprout control. This rate recommendation will vary with stage of sprout growth, cultivar and storage facility, and first consult the label of the clove oil product you are using prior to application. Delay in subsequent applications after initial treatment may result in greater sprout growth than if no product was applied. By properly and frequently applying clove oil, short and long-term sprout suppression can be achieved with different cultivars and storage temperatures. Caution: it may be difficult to attain 100% sprout control and realize some sprout development may occur.

For additional information on additional methods to control sprouting in storage for organic potatoes download a copy of bulletin titled "Organic and Alternative Methods for Potato Sprout Control in Storage" at www.kimberly.uidaho.edu/potatoes/CIS1120.pdf.

FUTURE RESEARCH

The University of Idaho will continue to evaluate varieties and nutrient management for organic produced potatoes in the organic certified field at the Kimberly Research and Extension Center. Additional research evaluating organic methods for sprout and disease control in storage will continue. Stay tuned for results and recommendations based upon these findings.