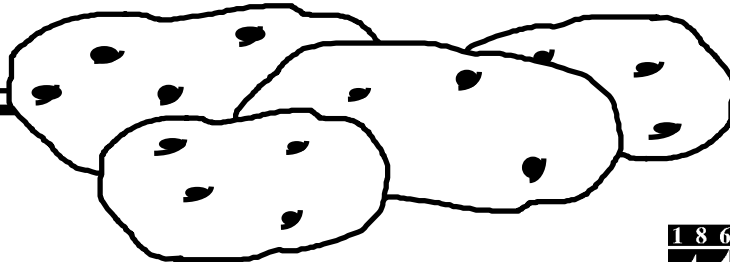


SPUDLINES



**MARCH 2005
VOL. 43 NO. 1**

**SEED
ISSUE**



Dear Potato Grower,

This is the first issue of SPUDLINES for 2005 with another issue scheduled in April/May. In this issue, articles are presented on the seed and seed handling. I want to put in a push for Maine seed. The virus levels are in the range of that of last year's crop. This and the risk of importing late blight or worse, should make buying Maine seed an easy choice. Peter Sexton reports on biodiesel. Distribution of fact sheets developed by UMCE staff continues with the fact sheet: LATE BLIGHT PREDICTION IN MAINE.

This publication is in part supported by a grant from the Educational Committee of the Maine Potato Board. The potato growers, processors and brokers of Maine pay assessments. Portions of these assessments were approved for the educational purpose of keeping Maine potato growers and related Maine industry people informed.

Sincerely,

Steven B. Johnson, Ph.D.
Crops Specialist

Upcoming Programming of Interest

**March
Tuesdays** **Agriculture Winter
School**
Houlton High School, Houlton

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BIODIESEL IN MAINE

Peter Sexton, Ph.D.
Extension Crops Specialist

There is increasing interest in producing biodiesel in Maine. The term "biodiesel" refers to vegetable oils or animal fats that are processed so that they can be used as fuel in diesel engines. There is more than one approach to processing the raw oil. Usually, it is mixed with methanol and a strong base, such as potassium hydroxide, under moderate heat and pressure to precipitate out glycerin. Dropping out the glycerin improves the performance of the fuel, improving cold flow properties and preventing the formation of deposits within the engine. The oil that is left after removal of the glycerin and other byproducts is technically termed "fatty-acid methyl esters," or more commonly, "biodiesel."

Biodiesel has several strengths to recommend it for use as an alternative fuel:

- It is a renewable fuel that can be domestically produced.
- It does not contribute to global warming.
- It has a much lower level of particulate emissions than does petroleum diesel: it burns cleaner.
- It has greater lubricity than petroleum diesel and essentially equivalent power.
- It can be readily blended with diesel fuel in various proportions without requiring engine adjustments.

Biodiesel blends are indicated by the letter “B” followed by the percent of the fuel that is biodiesel (e.g. a 20 percent blend would be called “B20,” while a 5 percent blend would be called “B5”). Biodiesel is usually sold in blends ranging from 2 to 20 percent with petroleum diesel.

A point of caution is in order. Biodiesel will clean fuel systems out, so you will need to change your fuel filters when switching from petroleum diesel to biodiesel, until the system has been cleaned of all deposits. Other than that, when used in a blend of 20 percent or less, there do not appear to be any issues with material incompatibility in engines.

Blending tends to improve cold flow properties of the fuel. However all biodiesels are not alike: they differ in their cold flow properties based on the initial material they were made from. Biodiesel derived from canola oil has among the best cold flow properties of biodiesels with a cloud point of 26°F. Soybean biodiesel has a cloud point of 38°F, and biodiesel made from beef tallow has a cloud point of 66°F.

If you will be using pure biodiesel (B100), be aware there are several materials that it may degrade. According to a report from the National Renewable Energy Laboratory, nitrile rubber, polypropylene, polyvinyl, and Tygon materials are vulnerable to being degraded by B100 biodiesel. This argues for using a blended fuel, at least initially, until you are familiar with the product. Materials such as Teflon, Viton, fluorinated plastics, and Nylon are compatible with B100 biodiesel.¹

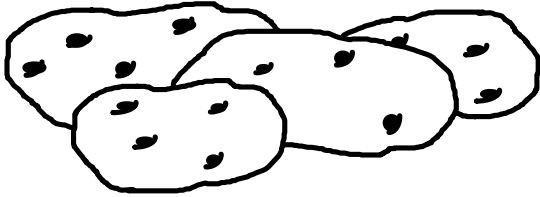
The high price of diesel fuel and the presence of a federal subsidy for biodiesel use combine to make biodiesel production look attractive. Currently, we are trying to get support for a feasibility study to evaluate whether producing biodiesel in the County would be profitable. This is something that needs to be penciled out and thought through, and it raises the question of what a biodiesel industry might look like here.

Canola would be the prime candidate for a raw material because of its high oil content (about 45 percent oil), and its adaptation to our climate and soils. The presence of an alternative market in Canada also makes canola an attractive choice for producing biodiesel. To make biodiesel out of canola, we would need storage and handling facilities for the seed coming out of the field (unless the growers stored it themselves), a seed crushing plant for oil extraction, and a biodiesel processing plant. With 5000 acres of current production and a yield of 1500 to 1800 lb per acre, we could produce about 3750 to 4500 tons of canola annually. This would produce about 400,000 to 470,000 gallons of biodiesel fuel.

In talking with people in the biodiesel industry, a plant that produces one million gallons per year is considered a pretty small plant. This implies that we may need to approximately double our current canola acreage to get enough raw material to justify a biodiesel plant. The scale of how large a plant needs to be in order to be efficient and profitable is a point in question. In my opinion, provided white mold was controlled in the canola, we could easily double, and maybe triple, our canola acreage as a production region. For acreage to further increase beyond that, I think we would need to look at some different ways of growing canola (rather than in rotation with potatoes)—or else bring in canola from other areas. But this is all speculative at this point.

Even if canola and biodiesel production develop into profitable enterprises in our region, they won't be a panacea for every problem. Inputs for canola are much lower than for potatoes, and the profit potential is also less. However, the canola and fuel markets appear to be more stable. A biodiesel plant could be one component of moving us toward a more diversified cropping system. Nationally, biodiesel production is expected to greatly increase in the next few years. Perhaps we can be part of that trend and benefit from it.

¹ K. Shaine Tyson, ed., *2004 Biodiesel Handling and Use Guidelines* (Golden, CO: U.S. Department of Energy's National Renewable Energy Laboratory, 2004), p 26. Available at <http://www.nrel.gov/vehiclesandfuels/npcf/pdfs/tp36182.pdf> (accessed 02/28/05).



SOYBEAN APHID IN MAINE

James Dwyer
Extension Crops Specialist

In the year 2000 in the midwestern United States, the soybean aphid, *Aphis glycines*, was discovered for the first time on the North American continent. It was found feeding on soybeans and at that time causing no significant economic impact. Since that time, populations have increased significantly and this aphid has created significant economic impacts for midwestern soybean producers.

The soybean aphid is common to Southeast Asia and not native to North America. What has been very interesting to watch is how rapidly this aphid has expanded its range through the U.S. In the five years since its initial discovery in North America, it has expanded its range from the Midwest, across New York, into Connecticut and now into Maine.

In September of 2004 the Maine Department of Agriculture was conducting a survey for USDA/APHIS and discovered small populations of the soybean aphid, *Aphis glycines*, on soybeans in Maine. This is the first known discovery of the soybean aphid in Maine.

This aphid is in the same genus as the buckthorn aphid, *Aphis nasturii*, and is known to be able to overwinter in northern climes. Whether or not the soybean aphid can survive a Maine winter is yet to be seen, but if it can survive in Minnesota and Wisconsin, it is probably a safe assumption that it can survive here.

This find by the Maine Department of Agriculture is very important. This aphid species prefers the soybean plant as a host, and its propensity to go to other crops is not totally known; however, it does not appear to colonize potatoes. Potato growers need to be aware that research has shown that this aphid *does* have the demonstrated ability to transmit PVY in potatoes.

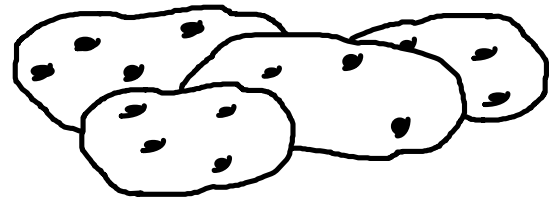
The soybean aphid and the buckthorn aphid are in the same genus, and these two insects do look very similar; however the cornicles, sometimes called the “tail pipes,” will be black on the soybean aphid. These black cornicles give it a somewhat distinctive appearance. The

soybean aphid also has the ability to expand its populations very rapidly under warm conditions. It has been suggested that the soybean aphid can double its population every two days under the right conditions. This explains the huge population explosions that have been reported with this insect in soybeans in the Midwest.

As we look toward the 2005 growing season, soybean producers here in Maine will want to be scouting for the soybean aphid. Producers in the Midwest have reported soybean yield reductions of more than 40 percent as a direct result of soybean aphids. At this point it is unknown if this pest will become a problem in Maine, but growers should be prepared. If populations expand to the point where suppression is necessary there are several products registered for use, but growers need to carefully read the product labels, especially the preharvest intervals. Several products have preharvest intervals longer than 21 days.

We strongly encourage all soybean and potato growers in 2005 to carefully scout for soybean aphids. If you would like more information on this aphid please refer to the following websites.

<http://bny.agriculture.purdue.edu/buckthorn/page2.asp>
<http://www.soybeans.umn.edu/crop/insects/aphid/aphid.htm>
<http://ceris.purdue.edu/napis/pests/saphid/pasba1.html>



HANDLING AND PLANTING SEED TUBERS PART 1. SELECTION, DELIVERY, AND DISINFESTATION

Steven B. Johnson, Ph.D.
Extension Crops Specialist

Selection of good seed is a critical decision faced by every potato grower. A good crop starts with good seed. The same amount of fertilizer, pesticide, and effort is put into a crop from poor seed as into a crop from good seed. Selection of seed that is both physiologically as well as physically healthy should be a goal of all seed purchasers. Disease-free seed is essential to a good crop. Physiologically young seed that has been handled gently and stored carefully is also important. Proper certification and inspection of seed helps ensure the quality. Consider only certified seed from a reputable

grower in an area with a regulated seed inspection program.

The importance of a good relationship between the seed supplier and the seed customer can't be overstated. Potato seed tends to be the largest single input cost of production. Seed buyers should make time to visit their seed suppliers and view their operation. Seed suppliers should welcome their customers' interest in the operation. Most farmers welcome a chance to give a quick overview of their farming operation. Not every year produces potato seed of the same physiological age or of the same physical health. These aspects can affect cutting and handling practices. Developing this relationship may provide the customer with some insight into what to expect of the coming seed crop.

Arrangements for delivery fall into place easily once the producer-customer relationship is established. Whether working through a seed broker or directly with the grower, specifying the exact details of delivery is critical. The variety and generation should be established as well as any specifics in regard to tuber size. Most seed shippers are well versed in loading trucks for shipments from cold to warm climates. If in doubt, ask the seed shipper for details. Operations that do not have enclosed bins for accepting and holding seed should arrange delivery so the seed can be planted right off. Potato seed quality will be maintained better in a seed storage building than a concrete slab open to the elements. If seed is being loaded or delivered during extremely cold periods, several inches of sawdust on the truck body floor will help insulate the tubers. This sawdust can also reduce bruising and other mechanical damage when the tubers are removed. In extreme conditions, a layer of paper between the truck body wall and the seed potatoes can help avoid cold damage.

The area receiving seed potatoes should be thoroughly cleaned of any sprout inhibition material before the seed arrives. The commonly used potato storage sprout inhibitor CIPC will adversely affect the performance of seed potatoes. While not always possible, the best place for receiving seed is an area that has not been exposed to CIPC.

The building where potato seed is to be received should be empty and clean. There should be no items unrelated to potato seed handling in the immediate area where the seed is to be stored. Trash and miscellaneous materials should be removed from the area to allow disinfecting to take place. Once the area is physically empty it should be thoroughly steam cleaned. This removes soil and dried plant matter from the walls, floors, bins, and handling equipment. Many pathogens can survive on dried, mummified potato tubers for many years. Potato

ring rot, the scourge of seed potato production, can live for up to five years in dried slime or potato tubers in the storage area. Obviously it is important to remove all remnants of potatoes from the seed receiving area. At times, a scraper is needed dislodge the old potato tubers from concrete surfaces. Readyng the building for seed delivery also involves thorough disinfecting; a disinfection material should be applied following steam cleaning. Options for disinfection material appear in table 1. A quaternary ammonia product should be used for disinfection in most commercial situations.

The handling equipment should be steam cleaned and disinfested similarly. Cleaning only the receiving area completes only part of the task. All equipment that may come in contact with the seed potatoes needs to be cleaned and disinfested.

DISINFESTING POTATO STORAGE AND EQUIPMENT

Careful cleaning and disinfection of potato storage and handling equipment is effective in preventing the spread of pathogens that incite contagious diseases such as ring rot. Cleaning and disinfecting surfaces that seed potatoes come into contact with will reduce the potential for spread of the causal agents of ring rot, blackleg, and other soft rotting bacteria. Effective disinfection practices will also sanitize surfaces that may be contaminated with the residual spores of many fungal pathogens.

Effective sanitation requires a thorough cleaning of all surfaces before a disinfectant is applied. Soil, clay particles, and organic material quickly neutralize the biocidal properties of most disinfectant materials available for use on potato storage and equipment surfaces.

Most disinfecting materials must remain wet on treated surfaces for up to ten minutes to kill all residual bacterial and fungal spores. The addition of a wetting agent to the spray solution may help keep surfaces moist for the required period. When disinfecting solutions are used for dipping knives, crates, picking baskets, or foot dip tanks, the solution should be changed frequently to avoid neutralization. Residual slime from ring rot has been found to survive for up to five years on protected wooden surfaces. Therefore, steam or pressure washing before disinfecting is critical where exposure to ring rot is known to have occurred. It is very difficult to kill ring rot bacteria in contaminated burlap bags. Contaminated bags should be burned.

Pesticides should never be stored in association with foodstuffs or seed potatoes. While the seed potatoes may

not be used directly for food, exposure to herbicides in particular can result in serious seed performance issues. In fact, any herbicide drift onto the seed potato plants during the growing season can manifest itself as abnormal or nonsprouting seed tubers. Mitotic inhibitors can be particularly troublesome.

Because seed is a high input cost, a person experienced with potato seed should be present to accept delivery. There are legal requirements with potato seed and the load should carry the proper tags and seals from the area of origination. Not all seed production areas have a mandatory shipping point inspection, but it is an additional warranty of quality.

Upon delivery, the load should be inspected. It should be verified that that minimum potato seed standards are met as well as any other prearranged requirements worked out between the shipper and the buyer. Sprouting, low temperature injury, diseases, and mechanical damage should be noted if they are present in the delivered seed lot. Close observation should reveal whether the tubers have been desprouted. If the tubers have been desprouted, the sprout initials in the eye will no longer be small points but larger, blunt and round. Sprouted seed is less desirable than nonsprouted seed as sprouting physiologically ages the seed. In most areas, there is a local inspection service that can scrutinize the load upon delivery. This further ensures that the delivered product meets expectations.

If multiple loads of one variety are delivered, they may be stored together but each load should be distinguishable in the seed receiving area. If multiple varieties are delivered, these need to be carefully separated to ensure that no cross contamination occurs.

Ideally, the seed should be received and stored at 38°F until a week before planting, at which time they should be warmed up to 50°F in preparation for cutting and planting. By this time, a determination of the physiological age of the seed should be made.

The physiological age of seed is an important consideration in potato seed selection and cutting. Factors affecting the physiological age of tubers include growing-season stress, storage temperature, and time. Warmer storage temperatures will speed the aging process of the tubers. Since precutting seed also increases the physiological age of the seed, an understanding of the stages of aging is necessary.

To determine the physiological age of seed potatoes, gather a sample, place it indoors and allow the seed to sprout. Observe the sprouts that come from the sample to determine the physiological age of the seed. There are distinct stages through which potato seed passes.

Dormant seed: If the potatoes do not sprout at all, they may still be in a period of dormancy. Most potatoes undergo a dormant or resting period. The length of dormancy varies with the variety. There are chemical and nonchemical means to break or greatly reduce the dormancy period.

Young seed: Young seed is characterized by apical dominance. Young seed will have one or just a few sprouts. These sprouts emerge from eyes on the apical or bud end of the tuber. There is a strong internal inhibitor that keeps eyes on the center and stem end of the tuber from sprouting. Eyes distant from the apical end may never sprout. Young seed will produce a plant with few stems. A low stem number leads to a low tuber set. Larger, but fewer, tubers would be expected from young seed.

Middle-aged seed: Middle-aged seed will have multiple sprouts. All the eyes on the potato could sprout. There is no clear apical dominance, as eyes from the bud end, the middle, and the stem end will sprout. Middle-aged seed produces plants with multiple stems that lead to high tuber sets.

Old seed: Old seed will have branched sprouts that can appear hairy. These sprouts are weak, and they will not produce a vigorous plant. Typically, plants from old seed will produce high tuber sets, but the plants lack the vigor to bulk the tubers to a desirable size. Seed can be so old that small tubers form on the sprouts once they emerge from the eyes. “Potato no top” is the name given to this disorder of extremely old seed. Seed that produces a “potato no top” symptom should not be used. Any stress during the growing season produces potatoes that are physiologically older than they would have been without the stresses during the growing season

Table 1. DISINFESTATION MATERIALS

DISINFESTANT	RATE	USES AND CAUTIONS
Quaternary ammonium compounds:	200 ppm	For use on storage floors,

walls, bin boards, bulkheads, crates, bulk bodies, conveyers, baskets, machinery, and bags.

Sodium hypochlorite products:

Bleach products (5.25% chlorine bleach solutions: e.g., Clorox)	1 gal/10 gal water	Use on machinery only.
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Calcium hypochlorite products: (50% powders such as B-K, Agway Dairy Bactericide, etc.)	2 1/2 cups per 10 gal water	Use on machinery only.
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MAINE'S POST HARVEST TEST RESULTS

Terry L. Bourgoïn, Director
Division of Plant Industry
Maine Department of Agriculture

The Post-Harvest Test results are in, and once again they show that Maine's seed potato producers have done an excellent job controlling virus disease in their seed crop. However, the results are not quite as good as previous years, and the industry must remain vigilant to prevent the buildup of virus levels in future years.

In looking at the overall results of this year's Post-Harvest Test, approximately 71 percent of all the acreage represented by the samples evaluated in Florida had 0.55 percent total virus or less. In other words, three out of every four seed acres planted in Maine last year had 0.55 percent total virus or less. Many seed lots had no virus at all! This is great news with respect to the initial level of inoculum in Maine seed as we approach the 2005 growing season. The percentage of acreage meeting the 0.5 percent cutoff for Foundation tolerance is less than the previous three years, however, indicating that some spread of virus occurred last season. Figure 1, which summarizes the percentage of acres that met Foundation tolerance over the past few years, shows a leveling off of the acreage meeting Foundation tolerance in the 2005 crop.

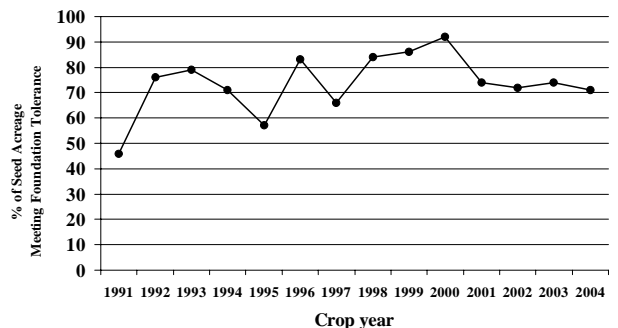
One important point stands out from the data contained in figure 1. The data shows the cyclical nature of virus levels over time. Maine has seen three cycles of virus buildup over the past few years, with low points in 1991, 1995, and 1997. In looking at these four "valleys" on the graph in figure 1, one can see that each one is less severe than the previous one. The low points of the graph correspond to 46 percent of the acreage meeting Foundation tolerance in the 1991 crop, 57 percent meeting Foundation tolerance in the 1995 crop, and 66 percent meeting Foundation tolerance in the 1997 crop.

So it is safe to say that the level of virus disease in Maine seed has not been increasing, even though there are temporary increases from year to year.

One problem with this year's result is that certain varieties were hit harder than others with respect to virus disease. The varieties with the largest acreage rejected through the Post-Harvest Test were Shepody (12 percent of the total Shepody acreage evaluated in Florida), Russet Burbank (11 percent of the total Russet Burbank acreage evaluated in Florida), and Atlantic (4 percent of the total Atlantic acreage evaluated in Florida).

How will this affect the supply of seed of these varieties? Is there adequate seed of these varieties available from other areas to meet the needs of our industry? Is it better to import seed with lower virus levels from areas that may have had other problems (like late blight) than to allow seed from Maine with higher virus levels to be planted? If not, how high can our virus

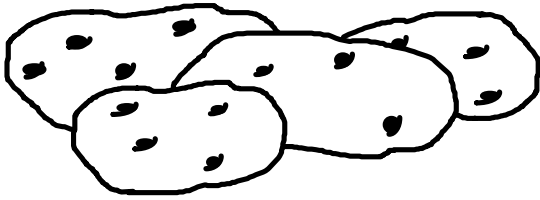
Figure 1. Percentage of Seed Acreage Meeting Foundation Tolerance 1991-2004 Crops



level safely be raised to meet the needs of our industry? With high seed prices this year, will growers plant seed that is rejected from certification and consider any fine for violating the Minimum Standards for Planting (certified seed) law a "cost of doing business"? These are some of the issues that must be addressed in the

coming weeks as we prepare for the 2005-planting season.

The actions taken during the next months will play an important role in the disease status (virus and other diseases) of Maine's potato industry. Will we see a rebound in the percentage of acreage meeting Foundation tolerance like those that we saw in 1992, 1996, and 1998, or will we see a further decline in acreage meeting Foundation tolerance, such as we saw in 1995 (the second year in a row with increased levels of virus disease)? The department and the industry must work together to address this question in a way that best meets the need of Maine growers.



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which seed is grown in November, December, and January. In fact, the state of Maine has a farm in Florida where these tests are performed. The virus levels are recorded and published annually in the Maine Florida Test Directory. Seed coming into Maine must be winter-tested, or have a waiver in order to be admitted without a winter test. Seed inspectors also plant 20-pound (approximately 100 seed pieces) samples of seed imported into Maine in a specific plot on the Aroostook Farm. These samples are also rated for virus content as a double check.

From the Florida Test for the 2004 crop season (to be planted in 2005), ten percent of the Russet Burbank and ten percent of the Shepody lots from Maine were rejected based on the virus levels. These data are the lines headed "Maine" in the table and represent seed that will be planted this year.

I have reviewed the data from both the imported seed plots and the Maine Florida Test. Maine imports many varieties of potato seed from many areas. I chose to look at only one seed area and only two important varieties, Russet Burbank and Shepody. These data are the lines headed "Imported" in the table and represent seed that was planted last year.

Bear in mind that lots with virus levels over five percent are rejected. For the upcoming season, ten percent of the Russet Burbank and ten percent of the Shepody lots from Maine's 2004 crop were rejected based on the Florida Test.

The following table lists the current data.

SEED POTATO RESULTS FROM THE FLORIDA TEST

Steven B. Johnson, Ph.D.
Extension Crops Specialist

One of the requirements for potato seed planted in Maine is that it has to be certified. The Division of Plant Industry, with the Maine Department of Agriculture, is the agency responsible for confirming that standards have been met. After passing field inspections, the next part of the potato seed certification process is a winter test. This is commonly known as the "Florida Test," in

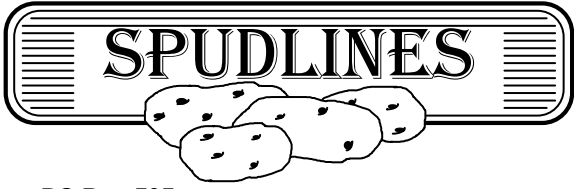
Source	Russet Burbank				Shepody			
	# of tests	VIRUS LEVEL			# of tests	VIRUS LEVEL		
		0-0.55 %	0.56-5.0 %	>5.0 %		0-0.55 %	0.56-5.0 %	>5.0 %
2005 Maine	109	45	45	10	59	19	71	10
2004 Maine	115	48	50	2	65	44	51	5
Imported	12	58	42	0	13	0	92	8

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