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FIELD OBSERVATIONS

I spent a couple of days this week in the Wisconsin Rapids area. I was impressed with the earliness of the season. Pinheads were already forming and the lower flowers were open. Ordinarily we would be just coming into bloom in mid-June. This indicates again how early this season is. This also suggests that growers need to anticipate pests and problems a couple of weeks early too.

Bloom appeared especially heavy. Some areas showed more pink than green. The marshes that I visited had great honeybee activity and a couple of growers indicated that they had observed more bumble bees visiting flowers this year than in the last several years.

Of course, it is still early to be estimating harvest, but barring any calamities such as hail or prolonged drought this should be another excellent crop for Wisconsin. Now the task is to manage the crop that is developing. Careful observation and timely action will be most beneficial in promoting an abundant harvest.

Teryl R. Roper, Extension Horticulturist, UW-Madison.

First you destroy those who create values. Then you destroy those who know what the values are, and who also know that those destroyed before were in fact the creators of values. But real barbarism begins when no one can any longer judge or know that what he does is barbaric.

Ryszard Kapuscinski

WISCONSIN: REARED BUMBLE BEES AND RESIDENT CRANBERRY POLLINATORS

By R.P. Macfarlane *Buzziniversal*, 43 Amyes Road, Christchurch, New Zealand
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Summary

The most important and species of bumble bees visiting cranberries in central Wisconsin are *B. impatiens, B. griseocollis* and *B. terricola* and *B. terricola* alone in Northern Wisconsin. These short and medium toungue lengthed species prefer cranberry flowers better than the other 9 Bombinae species in the vicinity of cranberry marshes. *B. terricola* is quite well synchronized with cranberry flowering, while *B. griseocollis* colonies are poorly synchronized with cranberry flowering. Generally bumble bee populations were low at 0.10 -0.38 per 100 m^2 with only 3 marshes with better populations of 2- 2.8 and 6-7 per 100 m^2. These resident bee populations are considerably lower than those measured in the Pacific north west. Much lower populations of social wasps and solitary ground nesting *Megachile* were recorded visiting cranberry flowers on the Wisconsin cranberry marshes.

Trials with reared *Bombus impatiens* colonies showed it was difficult, but possible to detect foraging from these colonies without marking the foragers. With one colony per acre this was possible even where the better natural *B. impatiens* populations existed. Differences in the ratio of queens to workers was a more sensitive measurement than densities.

1995 survey of resident pollinators of Wisconsin cranberries

In 1995, the species composition and density of resident populations of cranberry pollinators was surveyed. Cranberry pollinator populations were measured on 16 cranberry Central Wisconsin (Warren and Cranmoor districts) and two northern Wisconsin marshes at Manitosh waters and Cranberry lake. Between 18 June and 11 July, counts of cranberry pollinating insects were made on three 90 m^2 strips (60 x 1.5 m) at the margin of cranberry beds. A total of 25.2 acres was surveyed. On average each marsh had 14 census periods (range 3-31) during cranberry flowering. One to three census were taken per day between 10 am and 6 pm.

Bumble bees

In Central Wisconsin (Warrens, Cranmoor), the main species of bumble bees pollinating cranberry were *B. impatiens* (38%) , *B. griseocollis* (32 %), *B. terricola* (21.5 %), with *B. vagans* (4.1 %) and *B. ternarius* (4.4 %) as secondary species (Table 1). Other short tongued bumble bees in declining order of abundance were *B. affinis* (1.6 %), *B. bimaculatus* (0.7), *B. perplexus* (0.4) and *B. rufocinctus* (0.1 %). *B. griseocollis* had not been recorded on commercial cranberry marshes in eastern North America (Eck 1990, Kevin *et al.* 1983,Mackenzie and Averill 1995) or even wild marshes (Reader 1975). The late emerging *B. rufocinctus* was found at two sites, where prominent food sources were white clover (food source before-after cranberry flowering) and white sweet clover and spotted knapweed (food sources just after cranberry flowering). In British Columbia, *B. rufocinctus* can of secondary importance on cranberry marshes (Macfarlane and Patten unpublished, Mackenzie and Winston 1984), but this does seem to apply anywhere else in eastern North America within its geographic range (Milliron 1973, Kevin *et al.* 1983).

In north Wisconsin, the main species was *B terricola* (92.7 %) followed by *B. ternarius* (3.3%) and *B. vagans* (2.3 %) (Table 1). One *B. impatiens*, and no *B. affinis* or *B rufocinctus* were seen on the cranberry beds or among 580 bumble bees from other flowers in the spring. Studies of stocking marshes with *B. impatiens* can measure their impact on the bumble bee fauna most readily beyond central Wisconsin, because there are negligible populations of *B. impatiens* in north Wisconsin compared to central Wisconsin. This also suggests that survival of any *B. impatiens* released from reared colonies in north Wisconsin is likely to be negligible.

Table 1. Species and caste composition of bumble bees on cranberry marshes

Region and treatment	Species as a percentage of all *Bombus*							
	terricola	*impatiens*	*griseocollis*	*vagans*	*ternarius*	*affinis*	*perplexus/bimiculatis*	Total bees
North	92.7	0	0.3	2.3	3.3	0	1.6	331
Central-unstocked	13.9	37.2	28.9	10.4	3.8	3	2.4	247
Central-stocked	17	53.3	23.5	1.2	1.7	0.7	0.5	904
Central-overall*	21.5	37.8	32.3	4.1	4.4	1.6	1.2	825
Worker:queen Unstocked	5.4:1	1.1:1	1.7:1	2:1	1:1	2.5:1	#	
Worker:queen Stocked	8.7:1	5.4:1	4:1	#	#	2:1	#	

\# all workers

* estimate assumes feral *Bombus impatiens* colonies would have produced a ratio of 2.2 workers to one queen on marshes stocked with *B. impatiens*. The extra 79 *B. impatiens* were assumed to have come from the reared colonies.

The long tongued *B. pennsylvanicus* and *B. borealis* made up 0.6 % of the resident population of bumble bees around the marshes. However, there were no *B. fervidus* or cuckoo bumble bees *Psithyrus* (three species) found on the cranberry beds in Wisconsin, even although *B. fervidus* ranked 8th among bumble bees species in central Wisconsin. This lack of long tongued bumble bee and cuckoo bumble bee species on cranberry marshes provides more extensive verification to add to that from Massachusetts (Mackenzie and Averill 1995) that these eastern Bombinae prefer other flowers to cranberries.

Only *B. terricola, B. griseocollis,* and *B. impatiens* seem to have a reasonably high preference for cranberry. The preference of these three species for cranberry is based on these species having 30-60 % more of their recorded specimens on cranberry flowers compared to other flowers around the cranberry marshes during the same period. Conversely, *B. vagans, B. ternarius, B. perplexus, B. bimaculatus, B. fervidus, B borealis* and the cuckoo bumble bees *Psithyrus* all seem to prefer other flowers to cranberry flowers. These species made up about half or less the level of the total Bombinae on cranberries compared to their importance around the marshes.

The early emerging *B. terricola* is considerably better synchronized biologically to cranberry flowering in the latter half of June and first half of July, because its colonies are in about the middle of their growth phase. This can be surmised, because of the abrupt change in the queen to caste ratio in the first half of June. The lack of foraging queens and dominance of workers then suggest that by mid June almost all colonies have hatched their first brood and it is mainly queens with the nematode that continue to forage of flowers (Macfarlane 1974). Their colonies are still some weeks off full size, because few males are in the field. *B. impatiens* colonies apparently reach this start of the growth phase about the end of June almost in synchrony with cranberry flowering (Fig 2.). The colonies of *B. griseocollis* apparently have hatched their first brood mainly towards the end of June and in the beginning of July (Fig. 3).

Bumble bee populations on the low extensive Wisconsin marshes were generally very low (0.10 -0.38 per 100 m^2). Average and peak densities at the three best sites were 2- 2.8 and 6-7 per 100 m^2. These sites were at Manitowish Waters, near Dexterville and near Warren (Jensen B marsh). Where there were larger populations of bumble bees in Wisconsin they seemed to be well distributed throughout the marshes, unlike in the larger marshes (30-800 acres) in the Pacific North west. The upper Wisconsin bumble bee densities are still low compared to the medium 2-10 and high 10-30 per 100 m^2 recorded in the Pacific North west (Macfarlane and Patten unpublished).

The highest populations of bumble bees recorded on cranberry marshes at in this survey were from sites with the most extensive areas of white clover and white sweet clover within at most two miles. Very few bumble bees were recorded at some of the more frequently surveyed sites with minimal food sources near Warren. This points to the importance of having flower food sources, while colonies are formed and afterwards too until the cranberries start to flower. A lack of dry nest underground sites or insufficient food at two sites in central Wisconsin appeared to lead to failure of *B. terricola* or *B. ternarius* to nest there. These sites had previously had prominent populations of queens foraging on blueberry or weeds in the cranberry bog.

Trials with reared *Bombus impatiens*

In central Wisconsin, the ratio of *Bombus impatiens* workers to queens increased about five fold in beds stocked compared to those without any extra colonies (Table 1). This difference is because the output of workers increased sooner from colonies bred prematurely by rearing. From this it is inferred about 80 % of the workers seen on these beds came from the *B. impatiens* colonies. The comparison would tend to

overestimate the contribution of the reared colonies to foraging workers, because sampling on unstocked marshes was earlier on average than the stocked marshes. Conversely, the proportion of workers of *B. impatiens* coming from these colonies will have been underestimated by the difference in the worker to queen ratio, because up to a third of these colonies were producing new queens towards the end of cranberry flowering. Both effects were considered to have a minor impact on the difference in ratios between stocked and unstocked bogs. In two of the three other commonest bumble bee species the worker to queen ratio was similar between cranberry marshes stocked with *B. impatiens* and those not stocked with *B. impatiens.* The average of 38 % composition of *B. impatiens* (among all bumble bees) for central Wisconsin was restored (Table 1) if the ratio of workers to queens of 2.2:1 (derived from all the other bumble bee species combined) was applied to *B. impatiens*. This ratio was then used to estimate that

Up to one colony per acre of bumble bees *B. impatiens* was used at three sites. At Fannings, bumble bees from the reared colonies were the predominant pollinators (Table 1). At Brockman homestead beds and near Dexterville *B. impatiens* was an important component of the bee pollinating population, but feral bumble bees (mainly *B. terricola, B. griseocollis*) contributed even more to the total populations (Table 1). The overall density of bumble bees achieved at these sites was nearly five times that of the best average for the region (Table 2), and the average density (1.4 ± 0.1 per 100 m^2) was 3 times greater than before the bumble bees were introduced (0.5 ± 0.2 per 100 m^2). However, no measurable estimate of extra *B. impatiens* was detected at four other sites. These sites were stocked at less than one colony per 3 acres and at most bumble bee densities were measured 2-3 times before the reared colonies were released.

Changes in the density of bumble bees only started to produce measurable results at about one colony per acre. Density results were rather inconclusive on the ammount of bee foraging from the reared colonies because of considerable intermarsh variations in bumble bee populations. Also bumble bee populations may increase with the season and as flowering progresses to its peak. Hence studies of the species composition and caste ratios provided more reliable evidence on the actual contribution of the stocked colonies to the total bumble bee population foraging on the cranberries.

Even on unstocked beds the populations of overwintered queens declined as the queens started colonies or died, while the workers increased as worker numbers in the colonies grew. As a result for the most extensively measured species (*B. terricola, B. griseocollis*) the worker to queen ratio more or less doubled during cranberry flowering.

Other pollinators

Eighteen solitary bees were recorded from cranberry flowers by 8 of the 10 recorders. These bees were commonest at part of the Fanning marsh near Wisconsin Rapids and were undetermined species of *Megachile.* These bees were effective cranberry pollinators. The same two species of native *Megachile* leaf cutter bees that were recorded visiting cranberry flowers in the Pacific north west are also in Wisconsin (Medler and Lussenhop 1968).

The 6 marshes with *Vespula* workers had 17 wasps recorded from them. These *Vespula* workers seem to be about as effective as honey bees in cranberry pollination based on working rate and the way they worked the cranberry flowers.

Three of the team of recorders in the Wisconsin cranberry pollinator survey noticed flies on or perhaps close to the cranberry flowers. The author saw only three flies (compared to 2 solitary bees and nine wasps) actually visiting the cranberry flowers. At least one of these flies appeared to be a tachinid, and none were hover flies. Hence the survey agrees with the records from Massachusetts (Mackenzie and Averill 1995) and New Jersey (Eck 1990) that flies are

not significant visitors of cranberry flowers. There is an isolated report of flies visiting cranberry flowers in appreciable numbers in the small commercial cranberry growing area in southern Ontario (Kevin *et al.* 1983).

The incidence of solitary bees seems to be marginally more consistent in Wisconsin than in the Pacific North west, but the species diversity seems to be similar. There seem to be rather more wasps visiting cranberry flowers in Wisconsin than the Pacific north west.

Acknowledgements

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SAFETY SEMINAR

About 60 young people between the ages of 9 and 18 attended a safety seminar in Dexterville. They learned about common safety practices related to heavy and light equipment as well as protecting themselves from the elements etc. Of course, the highlight of the day was soda and chips at the end of the program.

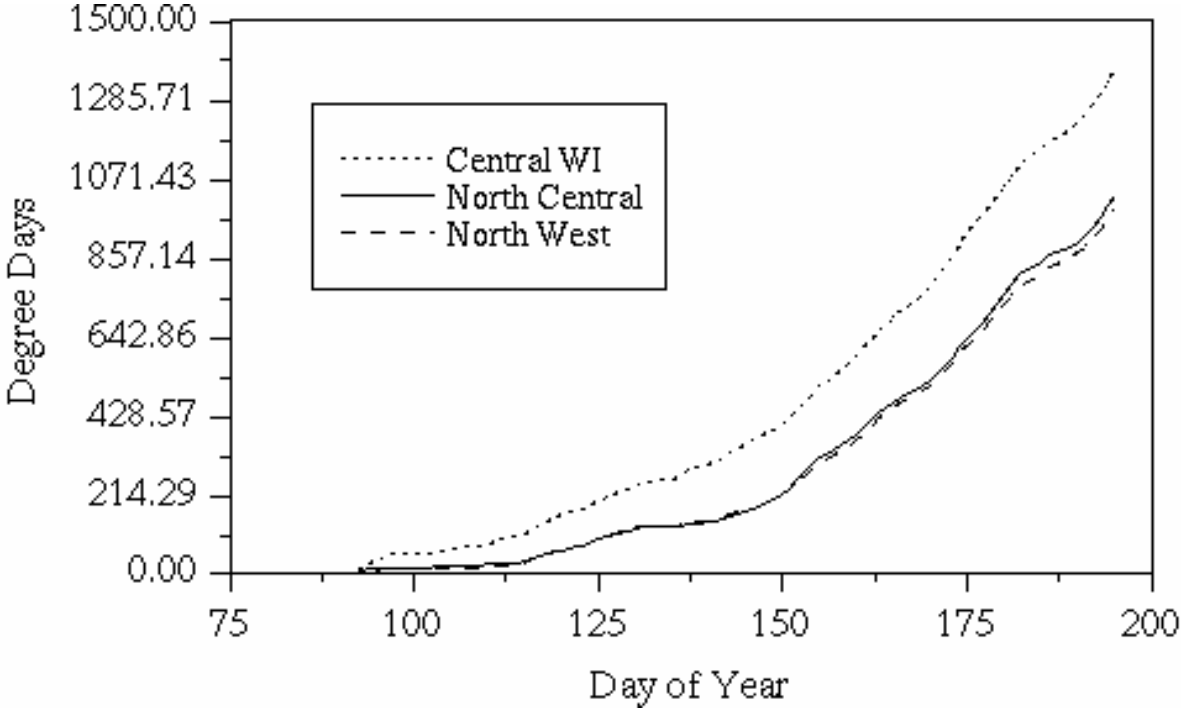
You might want to ask your young employees who attended the meeting about wearing appropriate safety equipment and about staying away from PTO shafts. They should also know about touching aluminum pipes, wearing sunscreen and lifting properly. Also, with some cost sharing funds from the University we were able to purchase a pair of cool safety sunglasses for all who attended. Hopefully these young people will wear these glasses to protect their eyes from debris as well as UV radiation.

Given the success of this year's meeting we will likely make this a regular part of our Extension programming, perhaps with multiple sessions in multiple locations. We will be following up later this summer with an evaluation to find out if the information presented was helpful and what we should add next year.

Our thanks to those operations who allowed their young employees to attend.

Teryl R. Roper, Extension Horticulturist, UW-Madison

CRANBERRY DEGREE DAYS, 1998



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