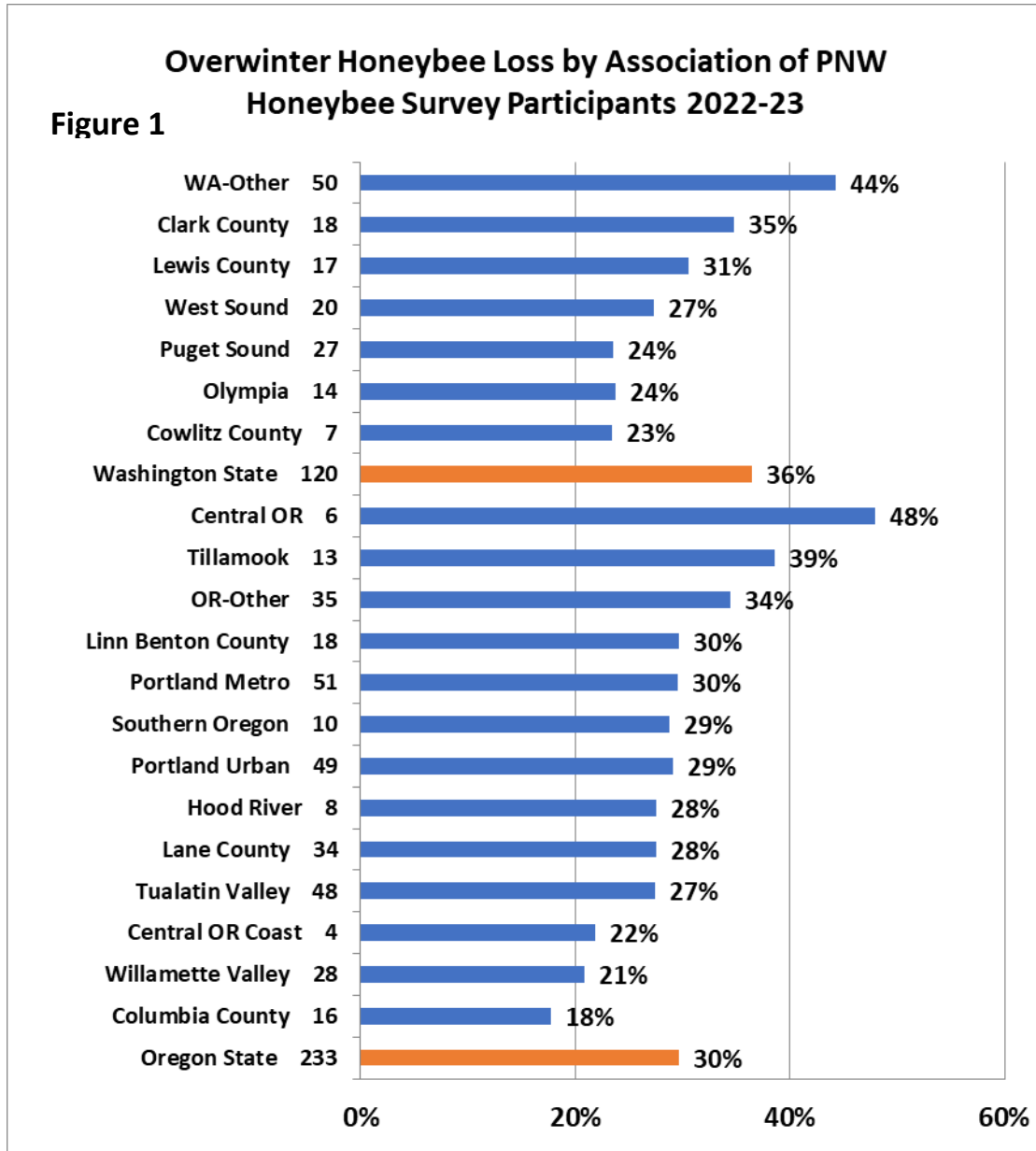


2022-23 Columbia Winter Loss by Dewey M. Caron

For the past 14 years, PNW winter colony losses and several managements related to bee health were solicited with an electronic honey bee survey instrument developed within the PUB bee group www.pnwhoneybeesurvey.com. A total of 233 responses (13 fewer than in the previous year and 95 fewer than 2020-21) were received from OR beekeepers with 120 additional returns from Washington beekeepers. During the 2022-2023 overwintering period, 16 Columbia County member surveys were returned, double the number last year.



Overwintering losses of small-scale Oregon backyard beekeepers was 30%, an increase of two percentage points from last year and decrease of 5 percentage points from

2020-21. Average backyard losses for last 14 years of Oregon backyarders is 37.5% For comparison, the average 14-year loss average for Or Commercial beekeepers (50+ colonies) is 21%.

Average overwintering losses of the 16 Columbia Co respondents was 18%, the lowest loss average of 12 Or associations. It was 2 percentage points lower than last year.

Columbia responses, reporting on 107 fall hives, showed higher losses of 8 frame compared to 10 frame Langstroth hives. Nine of nine nucs survived (0% losses). Four top bars all died (100% loss); statewide the past 8-year loss averages have been 50% for Top Bar hives. The 2 other hives included one long hive which survived. The 2nd other was not identified.

Figure 2

Winter Honeybee Loss % by Hive Type, 2022-23

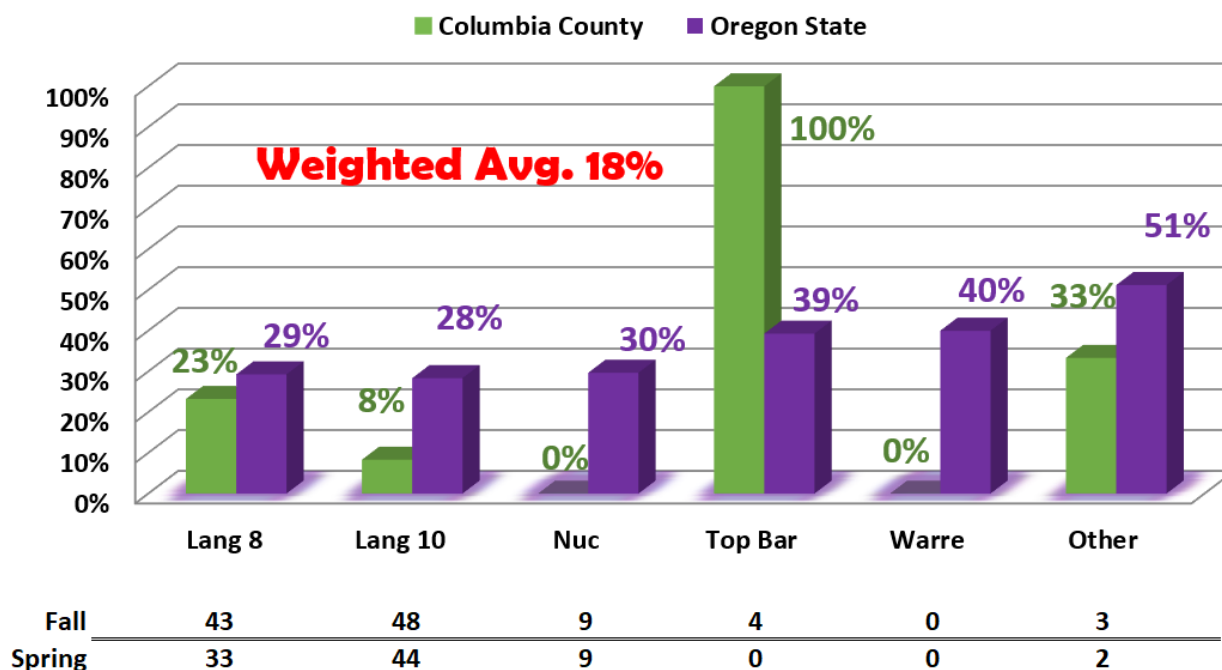
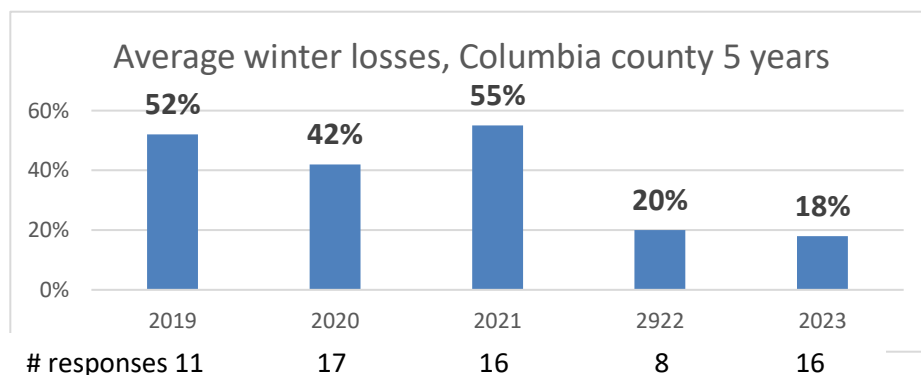


Figure 3 shows losses for Columbia County last 5 years. A bit of caution – I have had relatively few responses – the respondent numbers shown below years.

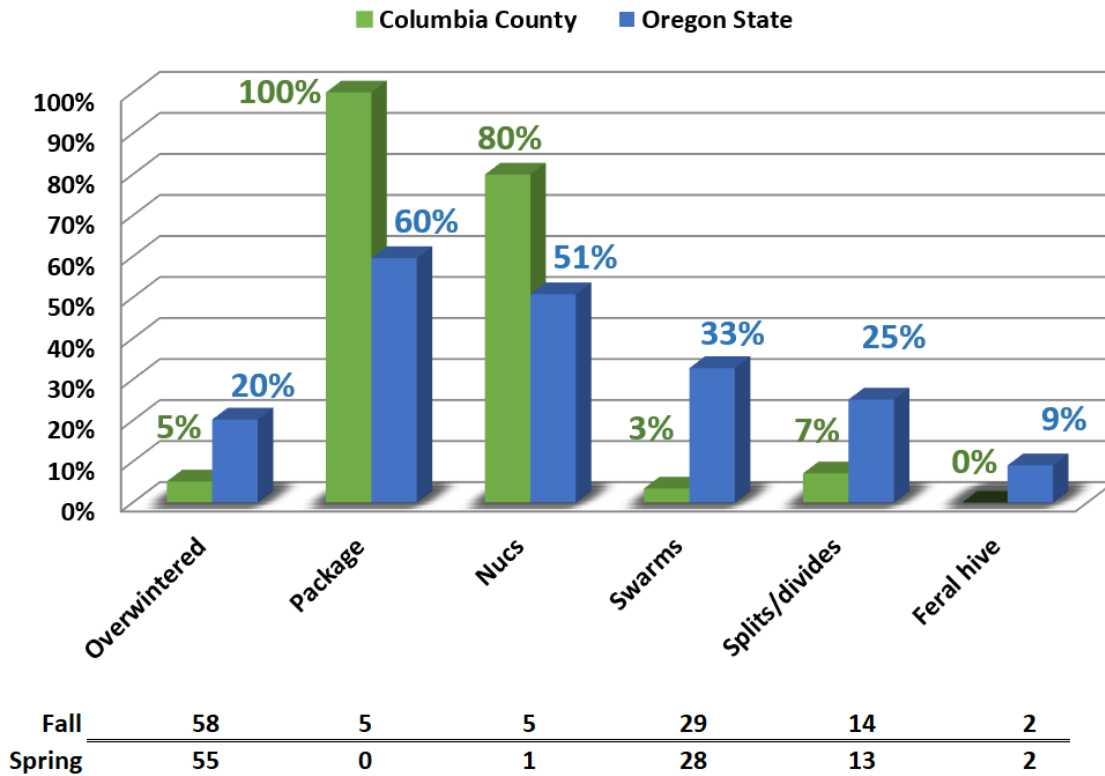
Figure 3



The survey also asked for **loss by hive origination**. Overwintered colonies had the best survival in PUB (12%) and statewide (20%). Package (67%) and nuc losses (57%) were similar, 5 times higher, similar to last year. Swarms (35%) and splits (33%) losses were slightly lower, 2 times higher. Neither of the 2 feral transfers survived.

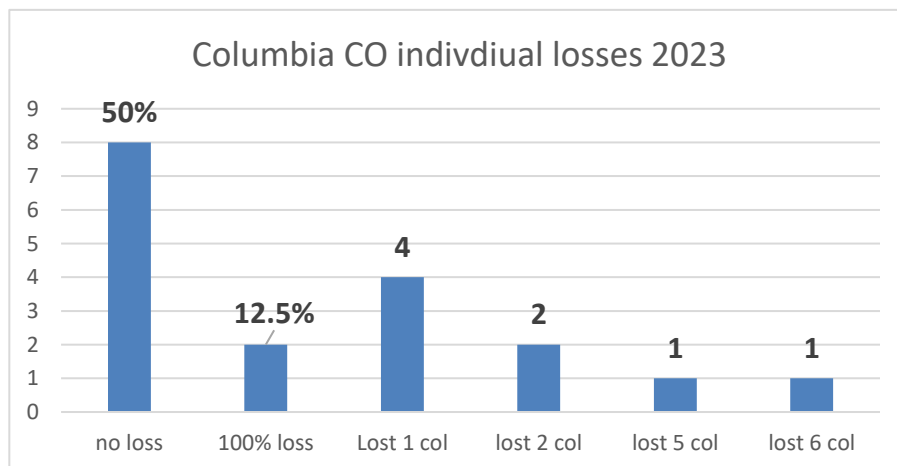
Figure 4

Winter Honeybee Loss % by Origination, 2022-23



Not all individuals had loss. Eight individuals (50%) had total survival, i.e., no colonies lost, total colony number 51 hives. Two individuals (12.5%) had a 100% loss (3 total colonies). Greatest number loss was one colony (4 individuals), two individuals lost 2 colonies, one lost 5 and one 6. Heaviest loss was 83% (5 of 6 colonies didn't survive winter).

Figure 5



Typical of the statewide data, the Columbia County respondents are largely beekeepers with few colonies. Two individuals had 1 colony (50% loss), and one had 2 colonies but without loss. None reported 3 colonies. So loss of individual with one or two colonies was very low at 25%. There were 4 individuals with 4 to 6 colonies (total 20 colonies), they had a 35% loss, the two individuals with 7 or 8 colonies (15 total) had 7% loss and finally the 4 individuals with 10+ colonies (total 59 colonies – highest number 16) had 13.5% loss level. Statewide this relationship of increasing colony numbers having, on average, lower losses has been constant every survey year, although this was not immediately evident for the 16 Columbia respondents (due to small sample size).

No Columbia respondents had a single or two years experience. The 3 respondents with 3 years experience (total 7 colonies), lost 2 for 28.5% loss level, the four individuals listing 5 or 6 years of bee experience lost 4 of 40 colonies – 10% loss level, the two individuals with 7 or 8 years of experience has 14 colonies but lost 5 for 36% loss level and those four individuals with 10+ years experience (highest number was 45 years experience) had an 18% loss level (7 of 39 colonies didn't survive). Statewide, as years of experience increase generally loss level falls; this relationship not evident for Columbia county respondents due to small sample size.

Twelve of sixteen CC respondents (75%) said they had a mentor available as they were learning beekeeping; state level was 74%. Four individuals had 2 apiary sites. Two said they moved hives during the year.

Reasons for Colony Loss/Acceptable loss

We asked individuals that had colony loss to estimate what the reason might have been for their loss (multiple responses were permitted – recall that 8 individuals had no loss). A total of 12 choices, 1.5/individual were listed. Highest selection, 6 of 12 individuals (50%), indicated varroa, 2 said queen issues and one each said pesticides, yellow jackets, weak in fall and poor wintering.

When asked about an acceptable loss, one said none, 2 said 5%, 5 said 10% (highest selection), 1 said 15% and 1 said 20% (the median), 2 indicated 25% as did same number for 33 and 50%.

Why do colonies die?

There is no easy way to verify reason(s) for colony loss. Colonies in the same apiary may die for different reasons. Examination of dead colonies is often confusing, some options may be ruled out, we are often left with two or more possible reasons for losses. There is a good deal of variance in opinion as to what might be an acceptable loss level. We are dealing with living animals which are constantly exposed to many different challenges, both in the natural environment and the beekeeper's apiary. Our acceptable loss level has crept upwards over time.

Major factors in colony loss are thought to be mites and their enhancement of viruses, especially DWV (deformed wing virus, plus declining nutritional adequacy/forage and diseases. Pesticides in the agricultural environment weakens colonies. Yellow jacket predation is a constant challenge to weaker fall colonies, Management, especially learning proper bee care in the first years of beekeeping, remains a factor in losses. What effects our changing environment, such as global warming, contrails, electromagnetic forces, including human disruption of it, human alteration to the bee's natural environment and other factors, play in colony losses are not at all clear.

There is no simple answer to explain the levels of current losses nor is it possible to demonstrate that they are necessarily excessive for all the issues currently facing honey bees. Varroa mites and the viruses they transmit are considered a major factor why colonies are not as healthy as they should be.

Managements

We asked in the survey for information about some managements practiced by respondents. The survey inquired about feeding practices, wintering preparations, sanitation measures utilized, screen bottom board usage, mite monitoring, both non-chemical and chemical mite control techniques and queens. Respondents could select multiple options and there was always a none and other selection possible. This analysis seeks to compare responses of this past season to previous survey years.

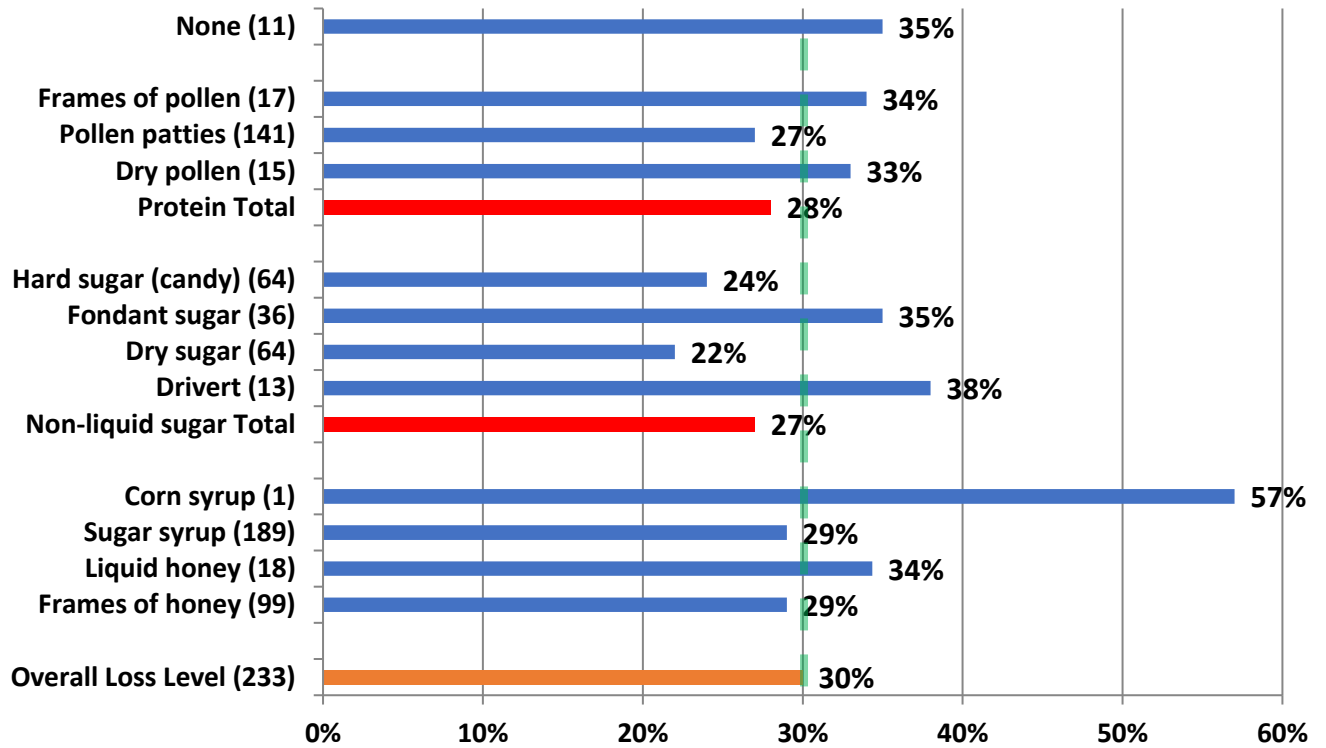
FEEDING: Oregon statewide survey respondents checked 620 feeding options = 3.1/individual. Columbia county 2.4/individual. Statewide thirty-three individuals (15%), other than those who indicated no feeding, selected a single choice and had 33% loss, 60 (27% of respondents) indicated 2 choices (31%, loss), 74 (34%the greatest number and medium) indicated 3 choices (they had 26% loss), 39 individuals (20%) had 4 choices with 36% loss, 17 (8%) had 5 choices (24% loss), 8 individuals had 6 choices with 21% loss. And 1 had 7 and 1 had 8 choices with a 13% loss.

The stateside choices, with number of individuals making that selection is in () in Figure 10; bar length indicates loss level of individuals doing this management. Those bar lengths to left of 30% **green dashed** marker (the average statewide loss) had better survival while those to right had greater loss level. Eleven individuals (same number as the previous year) said they did NO FEEDING. They had 55 fall colonies, lost 19 for a 35% loss. For Columbia county two individuals did none and only lost 1 of 13 colonies (=7.5% loss).

See Figure 10 for statewide feeding information below.

Figure 10

**Feeding Options w/ Loss Record
(#) = number individuals**



For Columbia County, 12 each (75%) fed sugar syrup and pollen patty. Six fed frames of honey and 3 said they fed liquid honey. In addition to the pollen patty protein feeders also fed frame of pollen and dry pollen (1 each). In addition to syrup, 2 each respondents fed drivert, fondant, dry sugar and 3 fed sugar cake. That is a high level of intervention

Summary: Statewide for the last 7 years individuals doing no feeding had 6 percentage point higher losses (average 45%) i.e. poorer survival, compared to an average loss rate of 38%. The average percent doing no feeding = 7% of individuals – this year it was 5.7%). Individuals statewide that fed sugar syrup had a 4.3 percentage point lower loss level average for the 7 years; this year it was one percentage point greater survival. Those feeding honey (as frames or liquid) had lower loss only during 3 of the past 7 years, this year it was a one point improvement. Individuals feeding non–liquid sugar (in any of the forms) had lower losses six of past 7 past winter seasons; this year it was a 3 percentage point difference, same as last year. Dry sugar feeders had slightly better or equal survival all 7 past winters while hard candy feeders had a much-improved survival 6 of 7 past winters, including this past winter. Fondant feeders had better survival 3 of the 7 past winters, but not this season.

For individuals feeding protein, the protein patty users showed better survival 6 of 7 years (this year losses were 2 percentage points better; dry pollen feeders had better survival in three of the past seven years. Pollen patty feeders had the best survival this year.

WINTERING PRACTICES: We received 552 responses (2.57/individual) statewide about OR beekeeper wintering management practices (more than one option could be chosen). Eighteen individuals (8%) of the respondents indicated doing none of the several listed wintering practices; these individuals had an elevated 40% winter loss, 10 percentage points higher than overall loss of those indicating some managements; the 2 Columbia County individuals who did nothing lost 2 of 14 colonies (14% loss level).

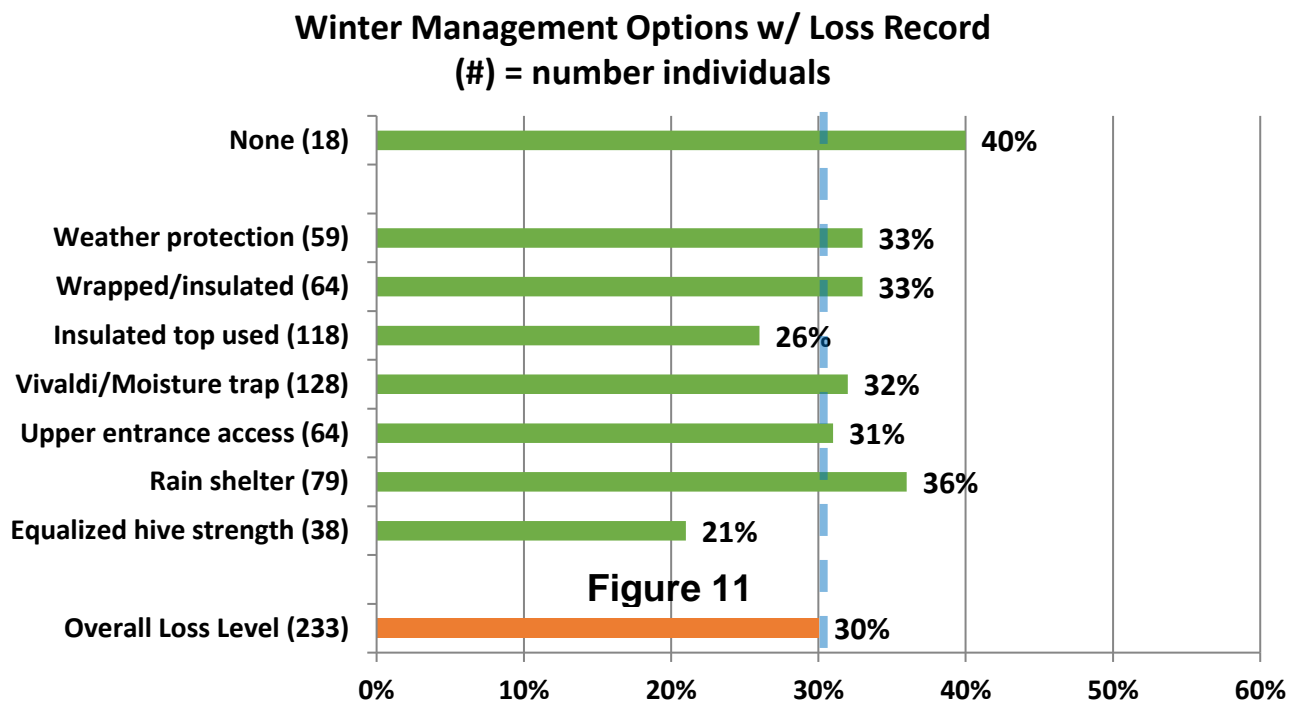


Figure 11 shows per cent of individual choices and bar length shows percent winter loss of each selection for stateside respondents. Bars to left of green dashed line means better survival than overall. Only equalizing (along with insulated top) improved winter survival. For Columbia County 9 (64%) said they insulated the top. Three CC individuals equalized and 3 also used a rain shelter. Four wrapped and 3 said they took winter protection. Eight used the ventilated top.

Over the past six years individuals that did no winterizing practice (average 11.3% of individuals) averaged 41.3 loss compared to 37.7% overall average loss of last 6 years, a 4.6 percentage point poorer survival rate. Only a single winterizing management improved survival all 6 years – insulated top (6 year average loss of 30%, a 7.7-percentage point improvement). Vivaldi/quilt box, upper entrance (most Vivaldi boards have an upper entrance built into the

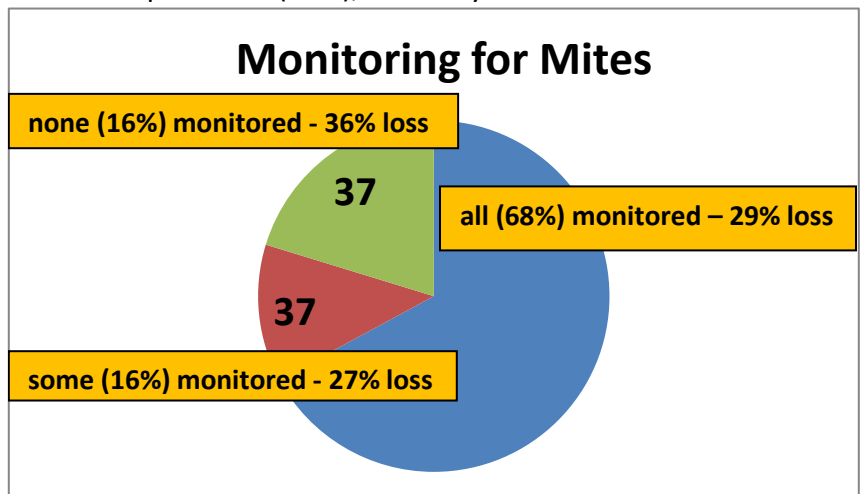
equipment), wrapping and wind/weather protection had only slightly improved survival rates and were not noted in all past 6 years. Equalizing hive strength was the best management to improve survival both this and the past year.

Questions focused on sanitation and screen bottom boards. Avoiding moving frames and reducing drifting were the two sanitation choices that demonstrated better average survival the past six years – 6-year loss rate was 34.3% for not moving frames which is 1.7 percentage points better survival) and 30.5% for reducing drifting a 5.5 percentage point improvement in survival. Overall sanitation appears to be relatively minor toward improving survival.

Examining the eight-year statewide average of Screen Bottom Board use, loss level of the 84% using SBB on all or some of their colonies had a 33.9% loss level whereas the 16% not using SBB had loss rate of 36.8%, a 3.1-percentage point positive survival gain for those using SBB versus those not using them. For Columbia Co this was not evident. Eight individuals (52 colonies) using SBB had a 11.5 loss level but the 2 not using them (9 colonies) had a 11% loss. Screen bottom boards offer a minor improvement for overwinter survival. There was a slight advantage statewide **in favor of closing the SBB over the winter period to improve survival**. Among Columbia Co 8 always closed (58 colonies) and had a 27.5% loss while the 5 who never closed (23 colonies) lost only 2 colonies overwinter for 8.5% loss level.

Mite monitoring/Sampling and Control Management

We asked the percentage of Oregon hives monitored for mites during the 2022 year and/or overwinter 2022-23. 159 individual respondents (68%), said they monitored all their hives. The losses of those individuals monitoring was 29%. Thirty seven individuals (16%) reported no monitoring; they had a higher loss rate of 43% loss. 37 individuals reported monitoring some of their colonies; they had a 23.6% loss. Double the number of Columbia County respondents monitored vs those who did not. Those 10 monitoring all colonies had ½ the losses (16% - 64 colonies) vs the 5 who did not monitor (29 colonies 31% loss level).

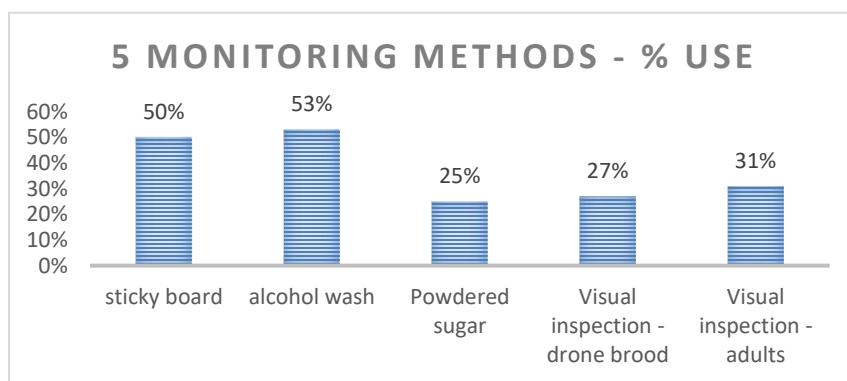


Monitoring alone is a means towards improved winter survival. The table below for statewide respondents for the previous 7 years compares % individuals and % winter loss for

individuals who monitored all colonies compared with those who monitored none. Seven-year difference is 8 percentage point better survival monitoring all colonies. The loss rate of 13-15% who monitored some colonies was variable, averaging 4 percentage points lower than those monitoring all colonies.

	ALL Colonies Monitored % individuals	% Loss	SOME Colonies Monitored % individuals	% loss	No colonies Monitored % individuals	% loss
2023	68%	29%	16%	27%	16%	36%
2022	66%	37%	15%	27%	18%	42%
2021	73%	34 %	11%	36%	17%	36%
2020	67%	33%	13%	16%	20%	49%
2019	67%	51%	15%	50%	18%	59%
2018	63%	38%	14%	26%	26%	49%
2017	63%	43%	15%	60%	22%	48%
7 year loss avg		38%		35%		46%

Individuals indicated use of 1.85 monitoring techniques on average. In total choices, in order of popularity of use, 104 individuals used alcohol wash and 98 individuals used Sticky boards (53 and 50% respectively of those responding to using a monitoring technique). 48 individuals used powdered sugar monitoring; visual inspection of drones (53 individuals) and visual inspection of adults (60 individuals) were also indicated. In the past 5 years, the use of sticky boards has decreased in use and alcohol wash has increased in use. This was the first year Alcohol use monitoring was the major monitoring technique.



For the Columbia County 10 who did some monitoring, three used Sticky boards, one sugar shake, 4 monitored drones and 3 looked at adults. There were 8 individuals who used alcohol wash (80% better than statewide).

It is important to KNOW mite numbers. Less effective mite monitoring methods include sticky (detritus) boards below the colony. Often so much detritus drops onto a sticky board that

counting the mites can be hard, especially for new beekeepers). Sticky boards used for a single day pre- and post-treatment can help confirm the effectiveness of a treatment, if numbers drop post treatment. Visual sampling is not accurate: most mites are not on the adult bees, but in the brood, especially when there is a lot of brood and the adult mites are NOT on the adult body where they can be observed (over 90% are on the lower abdomen, tucked within the overlapping bee sternites). Sampling for mites on drone brood is also not effective as a predictive number but can be used as an early warning that mites are present; if done, look at what percentage of drone cells had mites.

See *Tools for Varroa Monitoring Guide* www.honeybeehealthcoalition.org/varroa on the Honey Bee Health Coalition website for a description of and to view videos demonstrating how best to do sugar shake or alcohol wash sampling. The Tools guide also includes suggested mite level to use to base control decisions based on the adult bee sampling. A colony is holding its own against mites if the mite sample is below 2%. It is critical to not allow mite levels to exceed 2-3% during the fall months when bees are rearing the fat fall bees that will overwinter. It is also the most challenging time to select a control method (if one is deemed needed) as potential treatment harm may negatively impact the colony. We are seeing more colonies suddenly disappear (abscond?) during the fall, which may be related to the treatment itself.

Mite Control Treatments

The survey asked about non-chemical mite treatments and also about use of chemicals for mite control. Statewide thirty-one individuals (13%), four percentage lower than last year, said they did not employ a non-chemical mite control and 29 individuals (12%), the same percentage as last year, did not use a chemical control. Those 41 individuals who did not use a non-chemical treatment reported a 30% winter loss, same as overall, while those who did not use a chemical control lost 48% of their colonies, 18 percentage point difference. Among Columbia County 6 did not use a non-chemical treatment and had a 19% loss.

Non-Chemical Mite Control: Of nine non-chemical alternatives offered on the survey (+ other category), 51 individuals (28%) used one method, 68 used two, 45 used three, 26 used 4, 9 used 5 and 3 individuals used 6 plus one used or 7. Individuals using a single method had 35% loss rate, those using 2 had a 24.5% loss rate, those with 3 had a 25.5% loss, the 26 using 4 had 36% loss and the smaller number using 5 (44%), 6 (91%) and 7 had 100% loss. Clearly using more than one method/tool improves success.

Among the 10 Columbia County respondents using a treatment, 9 indicated screen bottom board, 5 took reduced drifting measures (57 colonies a 12% loss level), 3 requeened with hygienic stock, 2 practiced a brood break (of 24 colonies, had 25% loss level) , 2 said they used small cell (no loss in 17 colonies) and 1 minimum hive inspection

(single colony which survived.) Since small numbers can skew results I present results for the statewide respondents.

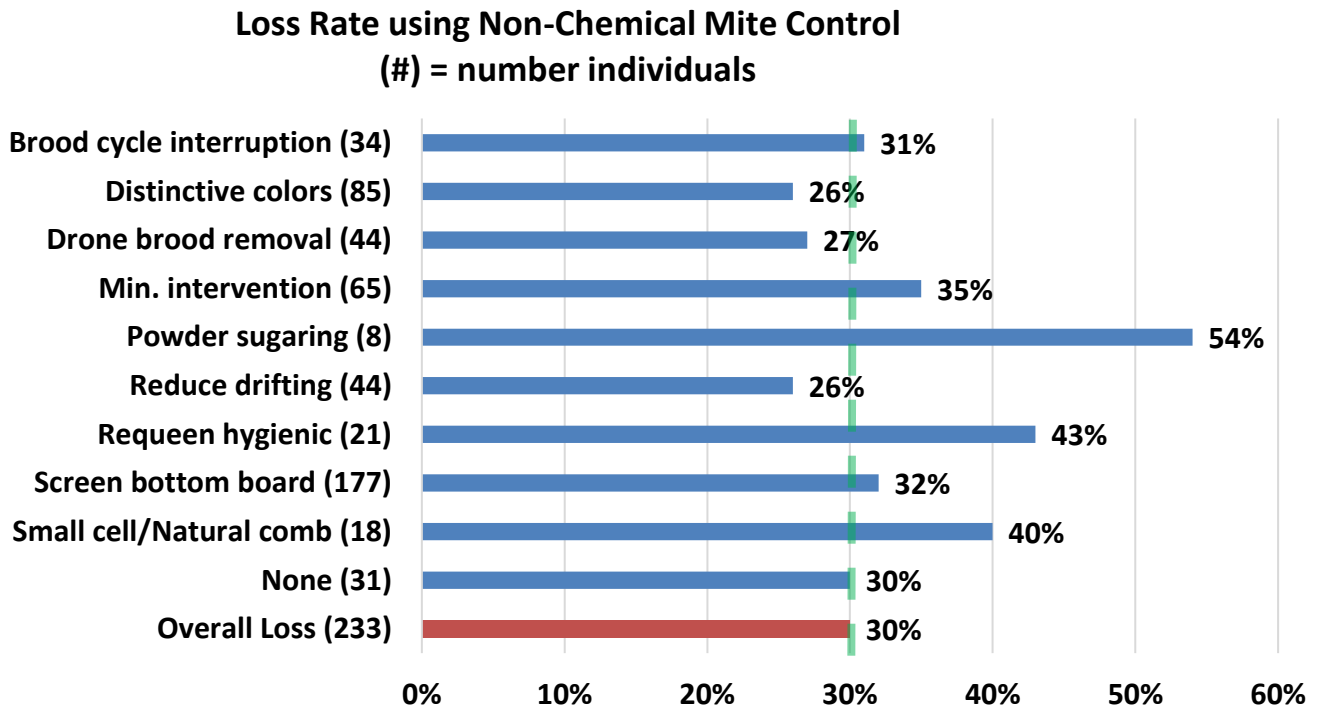


Figure 14

177 individuals (76% of total respondents) listed use of screened bottom board. The next most common selection was distinctive colors (84 individuals). The use of the remaining selections is shown in Figure 19; number of individuals in (), bar length represents average loss level of those individuals using each method. Those left of **green dashed** line had improved survival.

Three of the non-chemical alternatives have demonstrated reduced losses over past 6 years. Reducing drifting such as spreading colonies (30% loss average for 5 years – question not asked in 2016-17 survey) and brood cycle break (33.9% average) have consistently year after year demonstrated somewhat better survival than average loss (35.6% average loss last 5 years and 37.5% loss last 6 years respectively). Different colony colors in apiary 36% average loss and drone brood removal (37% average loss) were just slightly better than average 6-year loss (38%).

Chemical Control: For mite chemical control, 29 individuals (12% of total respondents) used NO chemical treatment. They had a loss level of 48%. One individual in columbia County with one colony did not used a chemical and had no loss. Those using chemicals used at rate of 3.3/individual. Thirty-eight individuals (17%) used one chemical (had 50% loss level), 42 used two and 3 (median number), 44 used 4, 18 used 5, 17 used 6 and 8 individuals used 7. Loss

levels declined for those using 2, (loss 32%), 3 (loss 27%) and 4 (losses of 20%) but were higher for the 18 individuals indicating 6 chemicals used (38%) before falling for the 17 and 8 respectively who use 6 (24%) and 7 chemicals (loss 18%).

Small numbers skew Columbia County results. The 2 individuals using apivar had 33% loss (1 of 3 colonies didn't survive), the 5 apiguard users (17 total colonies) had a 12% loss The 3 ApiVarLife users lost a single colony of 24 – 4% loss level. The formic users lost 28% while OAD was highest at 38% (1 user with 16 colonies). OAE and AOV were nearly same at 17% (OAE, 64 colonies) and 16% (OAV, 35 colonies).

Information below (Figure 15) is statewide results.

New to the survey this year we asked how many times a chemical was used in addition to which chemicals were used. For example, 55 individuals indicated they used the synthetic chemical Apivar (amitraz). The overall loss level was 28%. 42 used Apivar once and lost 27%; 12 used it twice, losing 37%. One individual used Apivar 3 times (label permits use twice per year) and lost 2 of 8 colonies overwinter – a 25% loss level.

There are two essential oil products on the market. Apiguard, the thymol gel was used by 64 individuals. They had loss level was 20.5%. The 44 individuals that used it once had a 20% loss, the 12 using it twice had loss of 24%, the 6 using it 3 times had a 19% loss level and the 2 individuals (6 colonies total, with one lost overwinter) had a 17% loss. ApiLifeVar, the wafer thymol product was used by 23 individuals - their overall loss was 22%. Those who used it once lost 17%, the 3 individuals using it twice had double the loss level of 33% while the 4 individuals that used ApiLifeVar 3 or 4 times had no loss of 13 overwintered colonies.

One hundred twenty-six respondents (62%) indicated they used oxalic acid vapor (OAV), 28 used oxalic acid dribble (OAD) and 14 used oxalic acid extended (OAE). Loss rates were 27% for OAV, 28% for OAD and 20.5% for OAE. For OAD, 22 used it once with 27% loss,, 5 individuals used it twice but had 31% loss and the single individual who used it 5 times had a 67% loss (lost 2 of 3 colonies). Overall loss for OAD was 28%.

For Oxalic acid extended (OAE) – the actual method used might have varied a great deal as everyone was experimenting on their bees as there is no approved product, or even application method, for OAE) – 18 individuals used it once with 25% loss, 8 said they used it twice (13.5% loss level), 5 indicated using it 3 times (19% loss) and one individual used it 5 times and lost 1 of 4 colonies overwinter (25% loss level).

For oxalic acid vaporization, I sorted the data differently. 26 individuals used it once and had 23% loss, 28 used it twice with 22.5% loss and 20 said they used it 3 times with 28% loss. This group using it one to 3 times, 84 individuals, had a 24% loss level. Additionally, 13 individuals said they used it 4 times with 30.5% loss and 10 individuals used it 5 times with 39.5% loss. Another group of 18 individuals used it 6+ times and had 31.5% loss. This group of

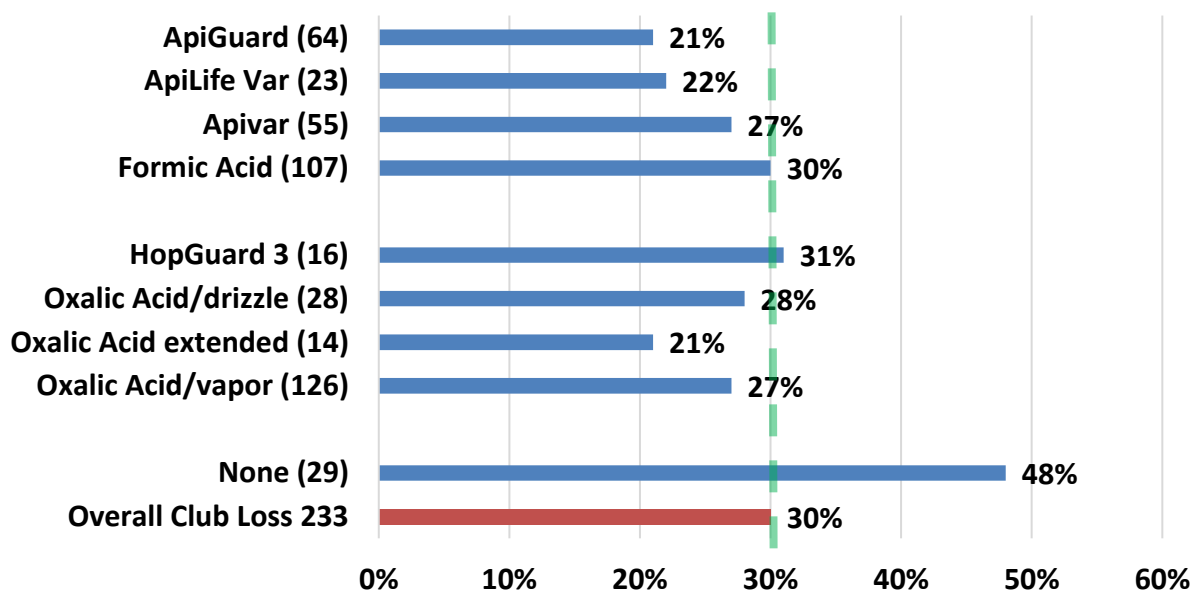
31 individuals, using oxalic 4 to 6+ times, had 33.5% loss. All oxalic acid users, a sum total of 125 individuals, had a loss level of 26.5 percent.

Not shown in Figure 20 were 4 individuals who indicated “other” with a total of 22 colonies – they had losses of 45.5%. At least one, with 6 colonies, lost 1/3rd, said they used thyme with mineral oil; one other mineral oil user with a single colony lost that colony. The 8 individuals using powdered sugar for mite control were included in the non-chemical data above. They had 26 colonies but lost 12 overwinter for 54% loss level. Finally, 2 individuals indicated they used fluvalinate - they lost all 6 of their colonies for 100% loss.

Consistently over the last 7 years, four different chemicals have helped beekeepers improve survival. These were essential oils Apiguard (average 7-year loss level 29.1%), Apivar (30.6% average 7-year loss level), ApiLifeVar (32.6% average loss level over last seven years) and Oxalic acid vaporization (30.7% average loss level over last 7 years. The average loss level has been 37.9% the last 7 years. Formic acid too has done better than average the last 7 years but the product has changed from MAGS to Formic Pro. This year the survey did not specify Formic Pro (listed was formic acid MAQS which no longer is on market), so I cannot be sure what Formic acid product was used by the 107 respondents who reported using it. Oxalic acid drizzle average of last 7 years is 36.2%, same as overall loss level of same time frame, 7 years The extended OAE (absorbing oxalic acid and glycerin into sponges) did very well in promoting better than average survival this year compared with last year when survival rate was only slightly better than average.

Figure 20

**Loss Rate using Chemical Mite Control
(#) = number individuals**



Consistently over the last 6 years four different chemicals have helped beekeepers improve survival. These were essential oils Apiguard (average 7-year loss level 29.1%), Apivar (30.6% average 7-year loss level), ApiLifeVar (32.6% average loss level over last seven years) and Oxalic acid vaporization (30.7% average loss level over last 7 years. The average loss level has been 37.9% the last 6 years. Formic acid too has done better than average the last 7 years but the product has changed from MAGS to Formic Pro. And this year the survey did not specify Formic Pro (listed was formic acid MAQS which no longer is on market), so I cannot be sure what was used as Formic acid by the 107 respondents who reported using it. Oxalic acid drizzle average of last 6 years is 36.2%, same as overall loss level of same time frame, 6 years The extended OAE (absorbing oxalic acid and glycerin into sponges) did very well in promoting better than average survival but last year was only slightly better than average.

The monthly use of Apivar (blue line), essential oil (red line) or an acid (green line) is shown in

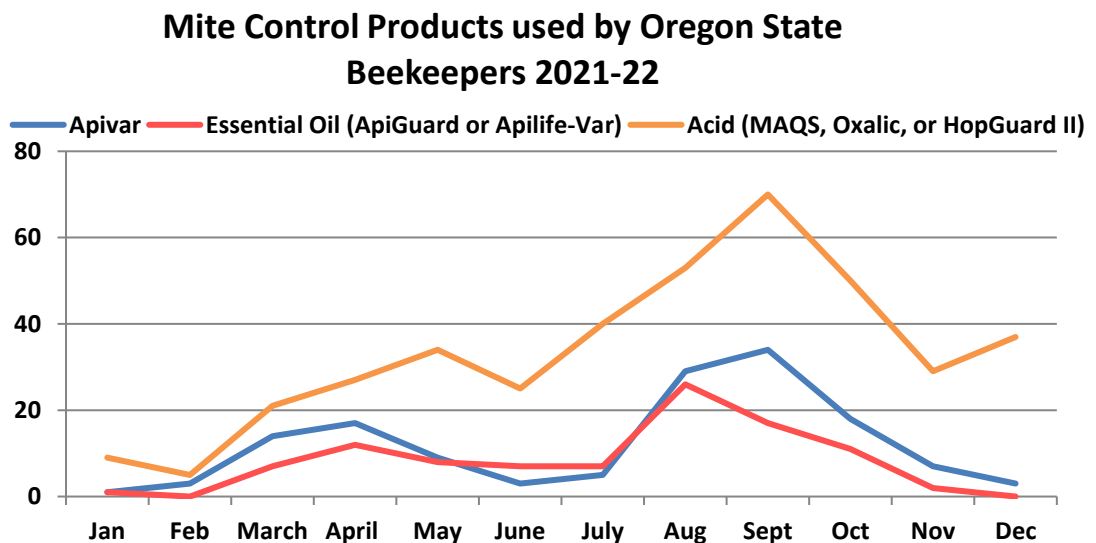


Figure 21 for 2021-22 season. Further review is needed to determine if the timing of treatments was more effective than at other times for the various chemicals.

Closing comments

This survey is designed to ‘ground truth’ the larger, national Bee Informed loss survey. Some similar information is additionally available on the BeeInformed website www.beeinformed.org and individuals are encouraged to examine that data base as well. Recall that the BeeInformed survey is measuring the larger scale OR beekeepers not the backyarders (See *American Bee Journal* April 2020 article by Dewey). Reports for individual bee groups are customized and posted to the PNW website.

We intend to continue to refine this instrument each season and hope you will join in response next April. If you would like a reminder when survey is open, please email us at

info@pnwhoneybeesurvey.com with "REMINDER" in the subject line. We have a blog on the pnwhoneybeesurvey.com and will respond to any questions or concerns you might have.

Thank You to all who participated. If you find any of this information of value, please consider adding your voice to the survey in a subsequent season.

Dewey Caron July 2023