Bee Health: when and how to control Varroa effectively

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National Apiculture Programme 2013-2016

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University of Limerick
Ollscoil Luimnigh

eagasc
Agriculture and Food Development Authority

Maynooth University
National University of Ireland Maynooth

Department of Agriculture, Fisheries and Food
An Roinn Talmhaíochta, Iascaigh agus Bia

Annual survey of Winter colony losses (COLOSS survey)

COLOSS questionnaire

Quantify winter losses

Identify the possible causes for the losses

April/early May

Full coverage of beekeepers

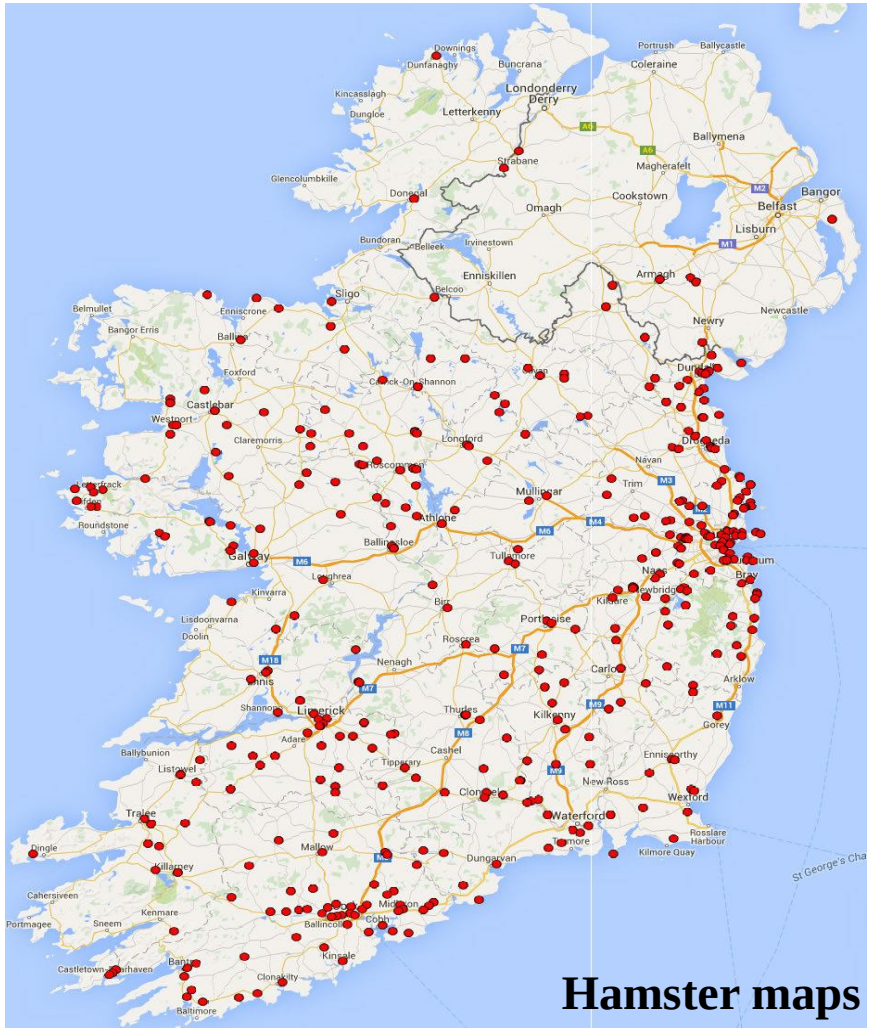
Dissemination methods

- **Post**
- **Email**
- **On-line (NIHBS/FIBKA)**
- **An Beachaire**

This years results !!

Response Rate : 450 beekeepers : ~15%

- 170 (37.8%) printed version
- 270 (60.0%) online

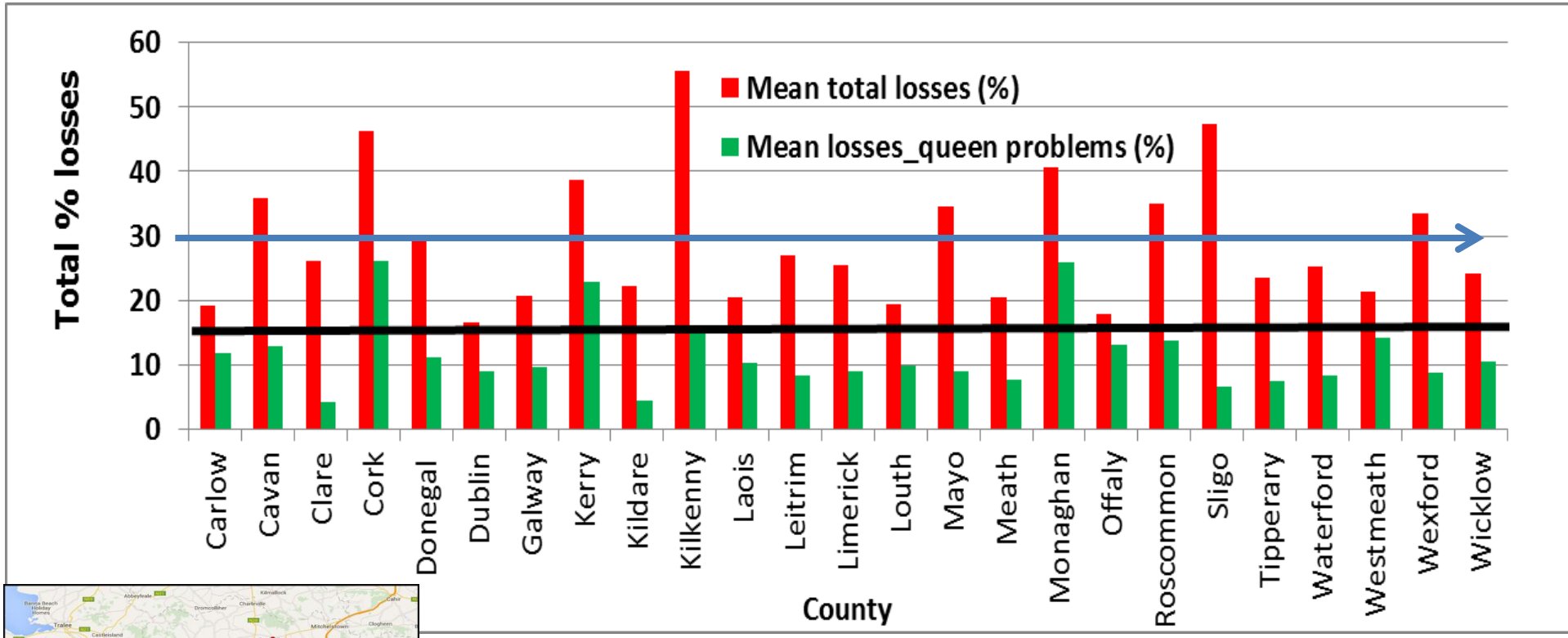


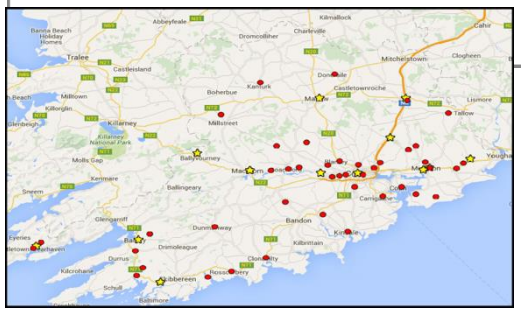
County	Response rate (n)	Affiliated 2012	% Response
Cork	64	461	13.9
Dublin	49	324	15.1
Louth	31	85	36.5
Galway	30	176	17.0
Longford	27	38	71.1
Limerick	27	60	45.0
Kildare	26	116	22.4
Wicklow	21	108	19.4
Roscommon	20	43	46.5
Tipperary	20	176	11.4
Mayo	19	133	14.3
Kerry	16	156	10.3
Meath	16	130	12.3
Wexford	15	179	8.4
Waterford	13	96	13.5
Clare	10	97	10.3
Kilkenny	10	96	10.4
Cavan	8	43	18.6
Laois	8	47	17.0
Carlow	6	29	20.7
Sligo	6	27	22.2
Monaghan	5	31	16.1
Donegal	4	55	7.3
Leitrim	4	70	5.7
Offaly	4	60	6.7
Westmeath	4	51	7.8

Winter colony losses for 2015/2016

National average : =29.5% (total % losses)

12.5% Queen problems **16.9% Dead colonies**

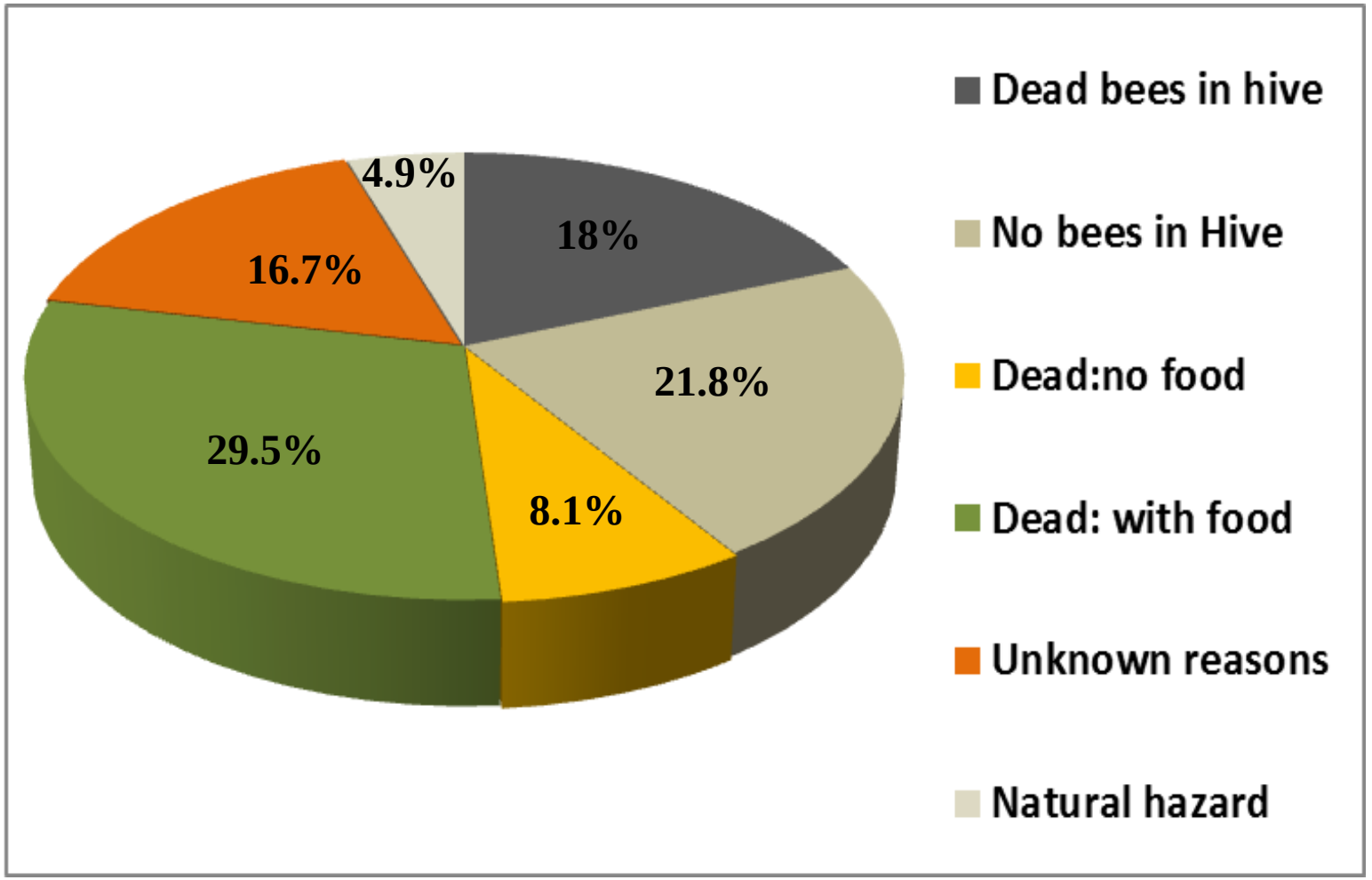




Losses>30% attributed to queen problems

Dead Colonies: status of colonies post-winter as perceived by beekeepers

n=752: 16.9%



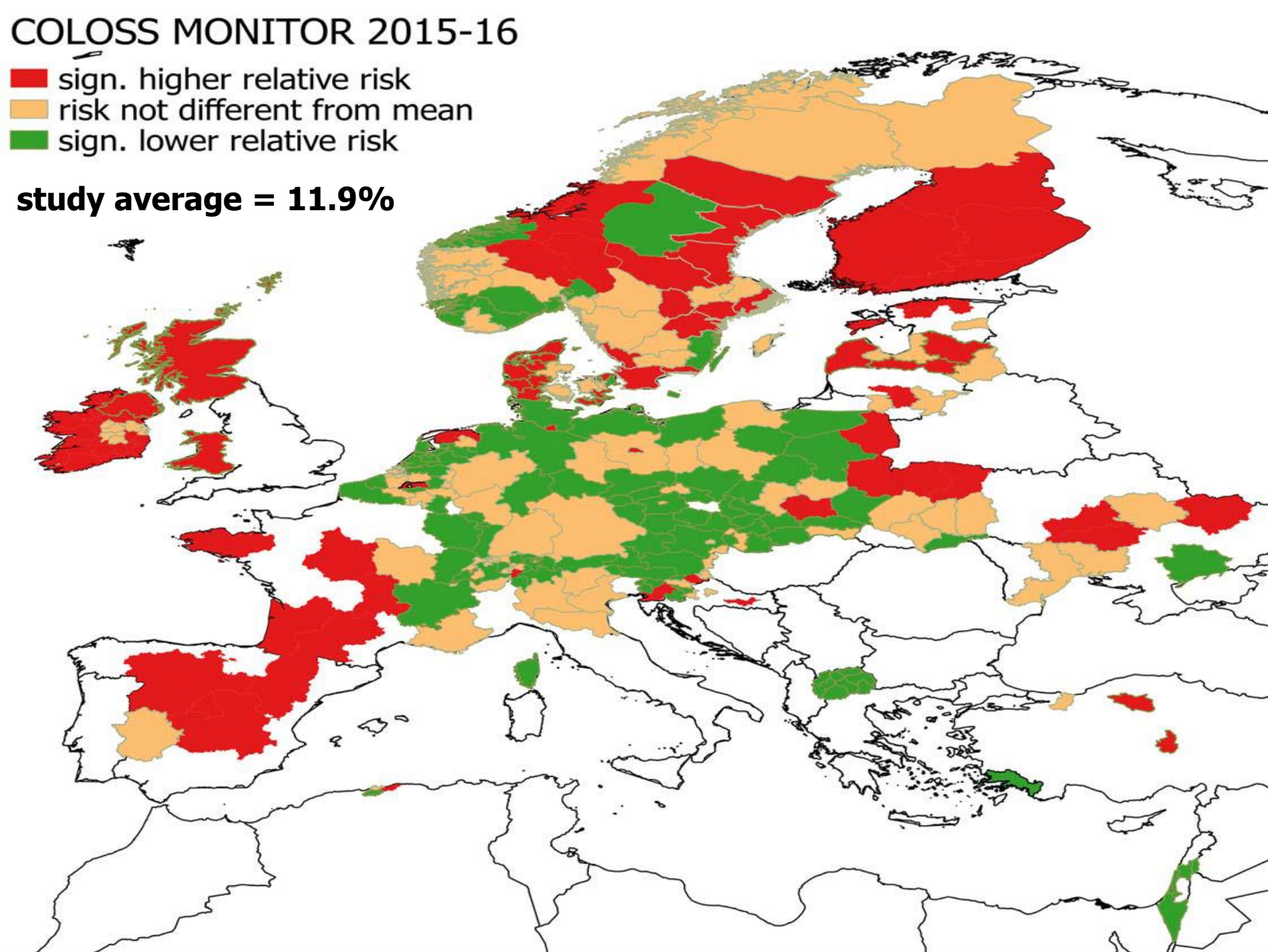
Coloss survey : An international survey

Data collected from 29 countries

- **total respondents = 18693**
- **total managed colonies = 399, 602**

Preliminary results for COLOSS monitoring group for press release on bee losses spring 2016
Note: All results should be regarded as preliminary; a more detailed final report is being prepared for later publication.

Country	No. of respondents	No. of colonies going into winter	Overall no. of colonies lost (dead colonies and colonies lost due to queen problems)	Overall winter loss rate (%)	95% confidence interval for overall winter loss rate Lower limit	95% confidence interval for overall winter loss rate Upper limit	Estimated no. of beekeepers in country in 2015
Austria	1289	23418	1897	8.1	7.4	8.8	25000
Belgium	451	4064	494	12.2	10.5	14.0	9490
Czech Republic	968	17350	1107	6.4	5.8	7.1	57000
Denmark	1186	12359	1913	15.5	14.4	16.7	6200
Estonia	71	5115	792	15.5	12.2	19.5	5969
Finland	299	6072	1043	17.2	15.4	19.1	3000
France	488	36734	4926	13.4	12.2	14.7	41850
Germany	4772	57165	6118	10.7	10.3	11.2	110000
Ireland	427	4059	1199	29.5	27.4	31.7	3000
Israel	49	32165	3362	10.5	8.2	13.2	500
Latvia	472	16367	2462	15.0	13.1	17.2	4300
Macedonia	296	17288	1378	8.0	7.1	8.9	3000
N.Ireland	93	574	162	28.2	22.6	34.6	1000
Netherlands	1425	11815	1276	10.8	9.9	11.7	7000
Norway	743	13249	1604	12.1	11.0	13.3	3500
Poland	492	17822	2012	11.3	10.2	12.5	57550
Scotland	154	701	126	18.0	14.6	21.9	1400
Slovakia	276	6783	553	8.2	6.8	9.7	17170
Slovenia	267	7910	1127	14.2	11.8	17.1	9000
Sweden	2092	25403	4039	15.9	15.1	16.8	13500
Switzerland	1259	17813	1769	9.9	9.2	10.7	17500
Ukraine	399	13850	1368	9.9	8.5	11.4	254010
Countries with a data set mostly for a limited number of regions							
Algeria	59	5729	759	13.2	11.0	15.9	20000
Italy	309	6815	855	12.5	10.9	14.5	55000
Spain	113	10786	2388	22.1	18.7	26.0	25535
Turkey	139	22160	1702	7.7	5.7	10.2	83467
Countries with limited data at this time							
Croatia	62	4303	706	16.4	11.6	22.7	12500
Lithuania	43	1733	324	18.7	14.4	24.0	not available
Wales	39	232	52	22.4	16.0	30.4	4110
Totals	18693	399602	47461	11.9			847441

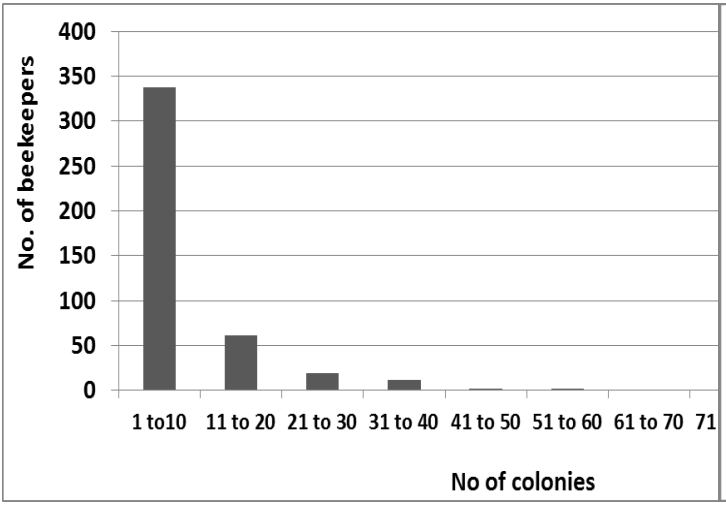

COLOSS MONITOR 2015-16
sign. higher relative risk
risk not different from mean
sign. lower relative risk
study average = 11.9%

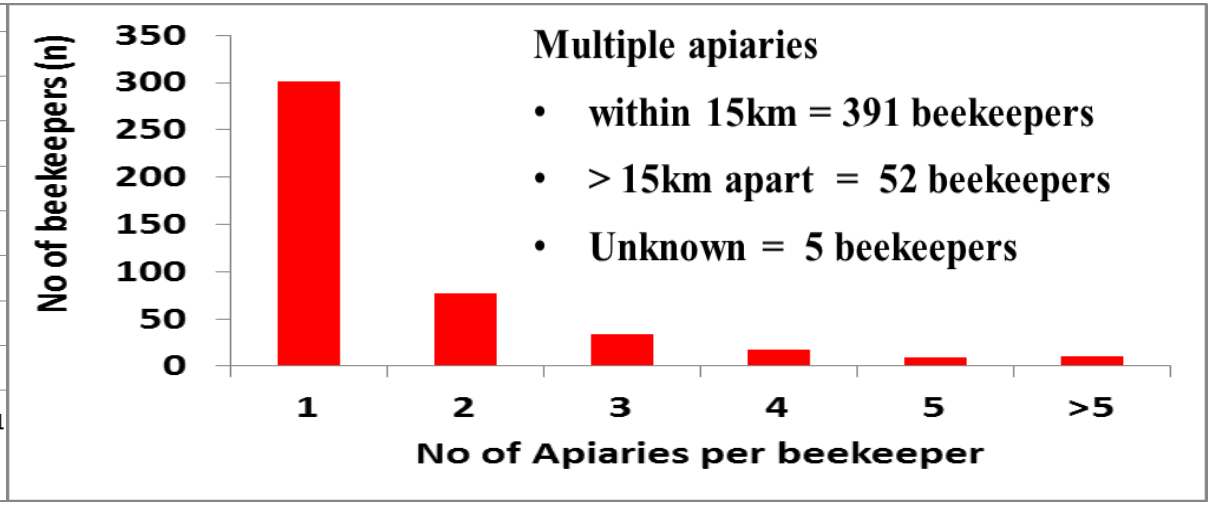
Factors identified as possible reasons for increased colony losses

- **Size of the beekeeping operation**
- **Insufficient control of Varroa**
- **Integrated approach for Varroa provided more positive outcomes**
- **Age of the queen overwintering**
- **Quality of the queen (mating success during the active season pre-winter**
- **Forage crops (oilseed rape and maize)**

Beekeeping operation size in Ireland: (potential influence on winter losses)

Size of Operation



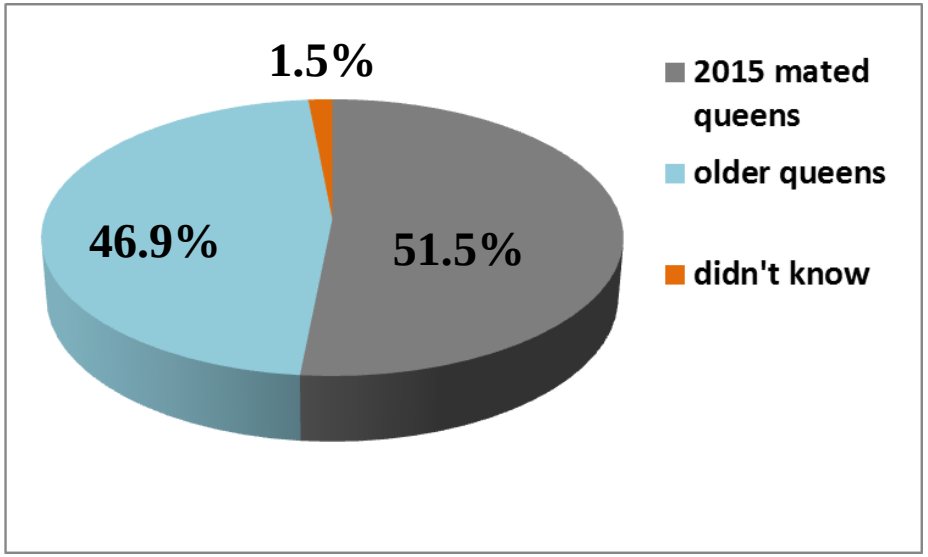


Migration and changing brood frames

	Yes	No	Don't know	Oilseed rape	Maize	Total responses
Migration and forage source (%)	13.11	85.9	1	15	2	*n*=426
	0%	1-30%	31-50%	>50%		Total responses
Percentage brood frames changed	15.9	38.2	16.6	29.2		*n*=426

Age and quality of Queen overwintering

Age:



Quality of queens:

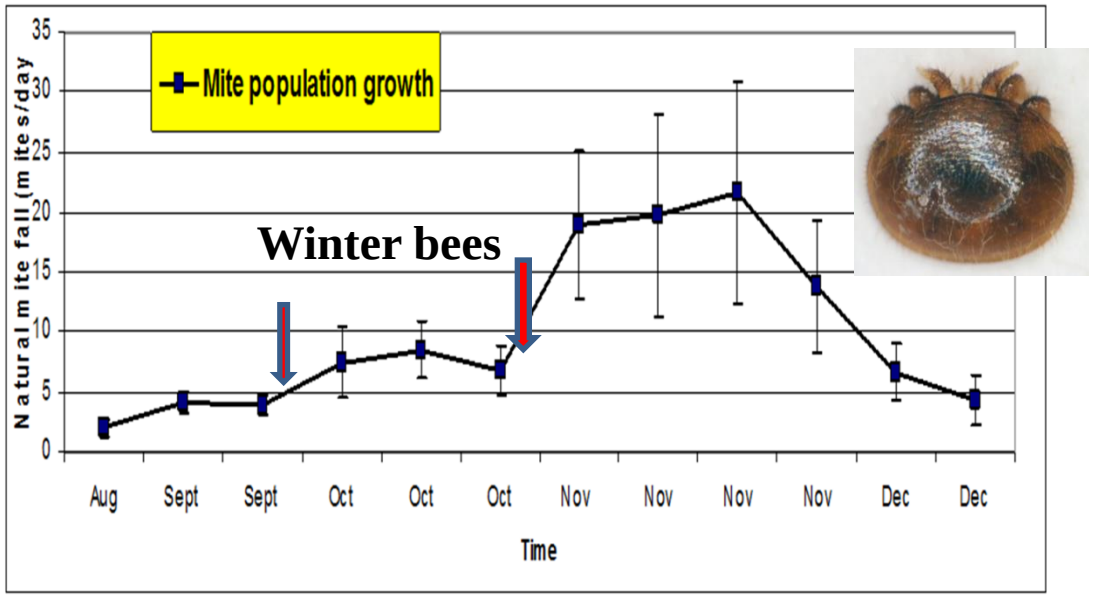
subjective data: data based on beekeepers perception:

	More	Normal	Less	Don't Know	Total reponses
Queen mating problems: 2015 (%)	34.5	41.9	4.7	18.8	*n*=420
	Better	**No different**	**Worse**	**Don't Know**	**Total reponses**
Survival rate of old v's young Q (%)	15.9	38.2	16.6	29.2	*n*= 403

The insufficient control of Varroa mite: a primary cause of increased winter losses

Feeds on the haemolymph of adult bees and developing brood:

- Physical injury
- Suppression of immune related genes
- Reduced haemolymph proteins
- Reduced vigour
- Reduced longevity
- Reduced flight duration
- Vector of many viruses



Physiological characteristics of the winter bee

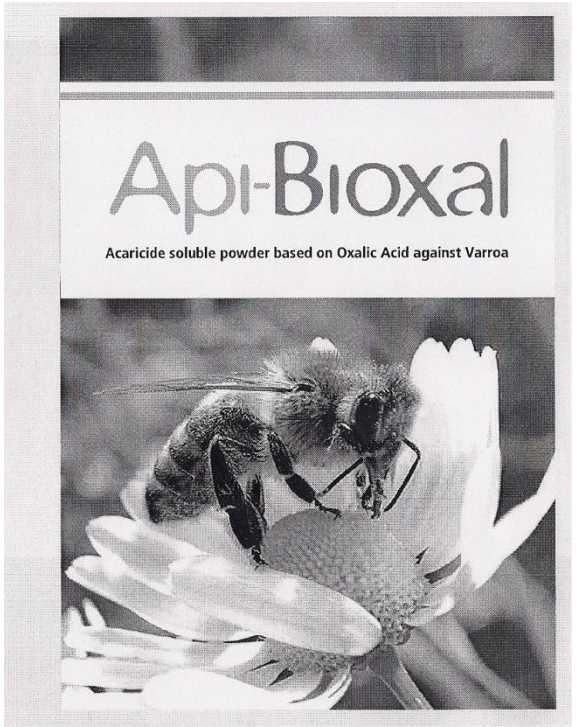
- High vitellogen levels
- High haemocyte count
- High tolerance to oxidative stress
- Extended longevity

Varroacides authorised for use in Ireland

Autumn Treatments

Summer/Autumn Treatments

Winter treatment

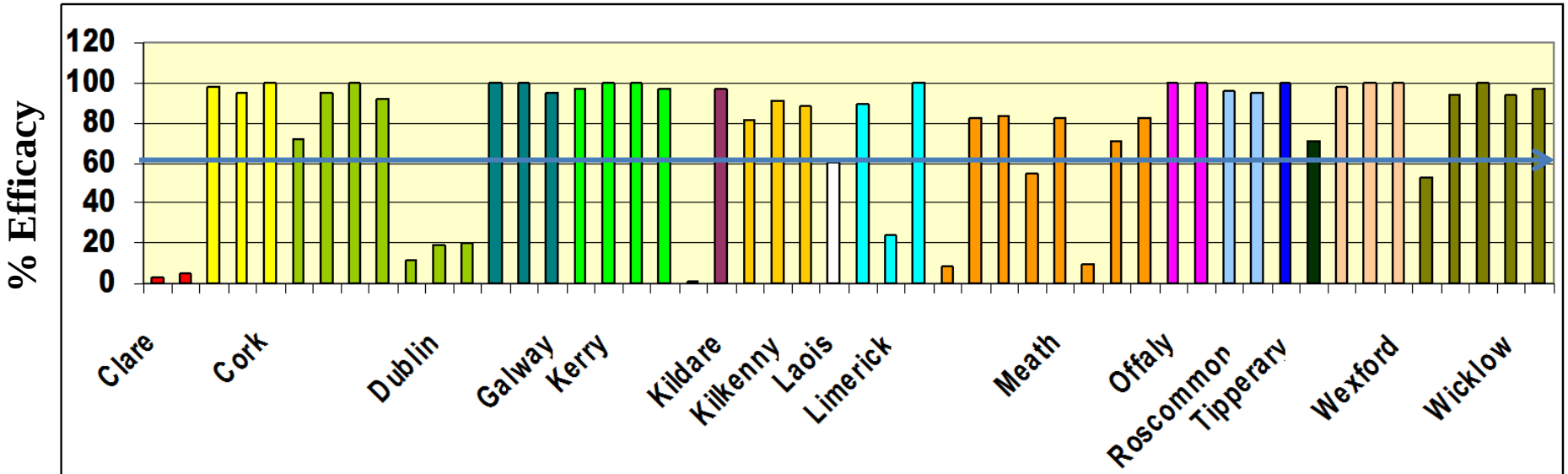


Assessing the efficacy of different Varroa treatments using the Teagasc research apiaries has been a key aspect of the National Apiculture Programme since

Bayvarol

- Contact insecticide: active ingredient flumethrin
- Treatment time 6 weeks
- In the past efficacy was 99.9%
- Varroa mite has developed resistance:
  - Production of monooxygenases
  - Mutation at the target site
- Reversion is unlikely

DAFM 2010



Apiguard

- Contact/inhalation insecticide: active ingredient thymol
- Treatment time 8-10 weeks (until product is empty)
- Mean efficacy 85-89% with high colony variability: (65-99.9%)
- (Coffey 2007, Coffey and Breen, 2015)

Reasons for reduced efficacy

- Ambient temperature must be >15C
- Brood area

Other negative effect:

- Reduces queen laying (temporary effect)

MAQS: Mite Away Quick Strips

- Inhalation insecticide: active ingredient Formic acid
- Treatment time: 7 days
- Mean Efficacy 70% with high colony (Coffey and Breen, 2016 in prep)

Api-Bioxal

- Contact (reduced acidity) insecticide: active ingredient Oxalic acid
- Treatment time: 7 days (only kills mites in the adult bees)
- Mean efficacy >90% using both the trickling and vaporiser method of application
- (Coffey and Breen, 2016)

Colony tolerability

- Bee mortality was significantly higher following the trickling method but had no effect on Spring build-up
- Vaporisation method had no significant effect on bee mortality

Overall conclusions:

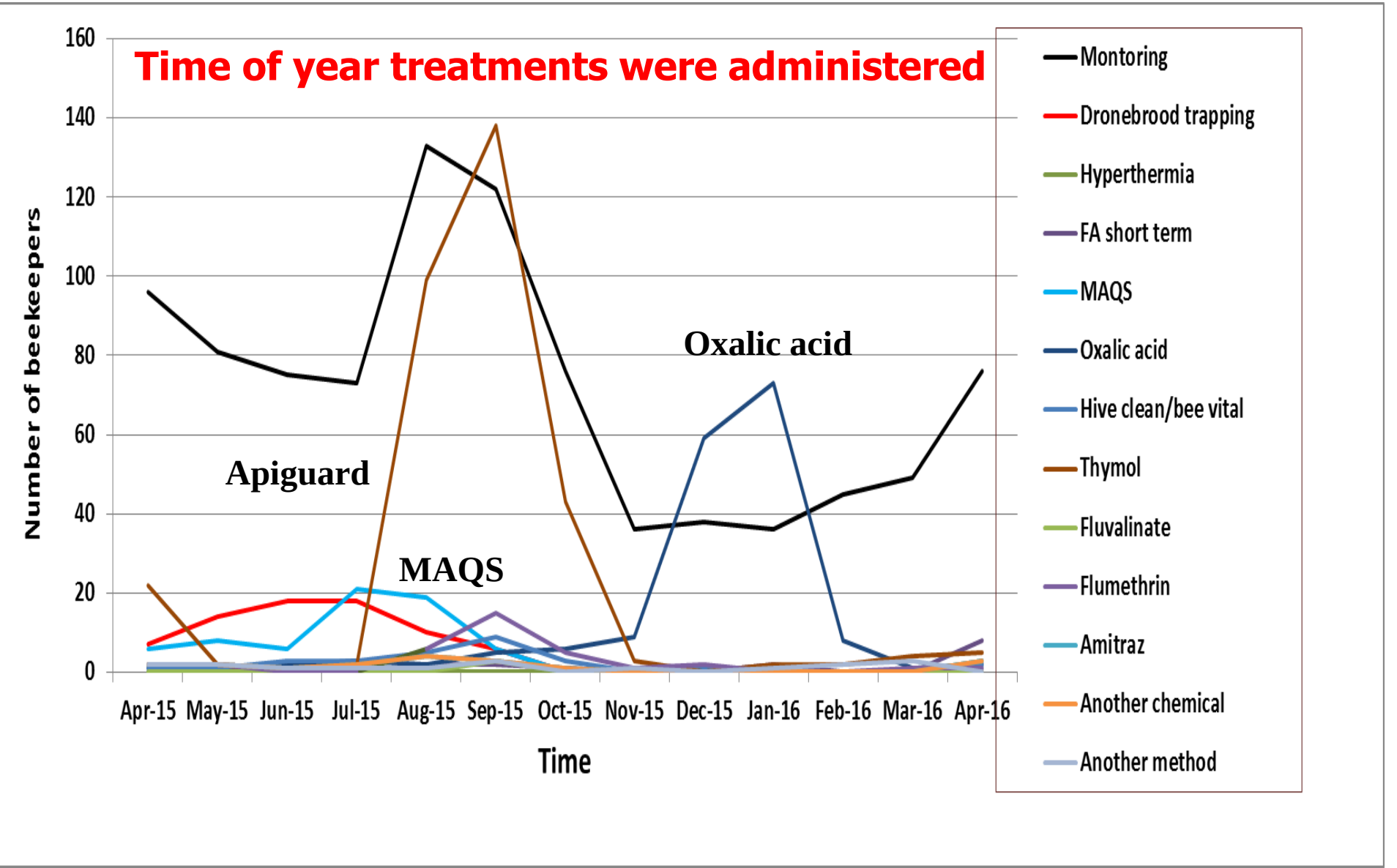
Varroa mite populations can be effectively controlled with minimum damage to the colony using

Apiguard (Autumn) + ApiBioxal vaporisation (Winter)

MAQS and other formic acid based treatments may also be effective Autumn treatments but further research is warranted

Varroa control methods used by beekeepers, 2015/2016

(Data from the COLOSS survey)



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PRESS RELEASE

from COLOSS

COLOSS,
Institute of Bee Health,
Vetsuisse Faculty,
University of Bern,
Schwarzenburgstrasse 161
3003 Bern, Switzerland.
www.coloss.org

[Immediate: 22/7/16]

Losses of honey bee colonies over the 2015/16 winter

Preliminary results from an international study

The honey bee research association COLOSS[1] has today announced the preliminary results of their international study of colony losses over the 2015-16 winter. Data were collected from 29 countries in this initiative, which is the largest and longest running international study of honey bee colony losses. In total 18,693 respondents provided overwintering mortality and other data of their colonies. Collectively, all responding beekeepers managed 399,602 honey bee colonies. The overall proportion of colonies lost was estimated as 11.9 %.

Co-Chairs of the COLOSS Core project for colony losses monitoring Dr Alison Gray and Dr Robert Brodschneider say: *"These loss rates vary considerably between countries. In this year's survey the highest losses were found in Ireland and Northern Ireland, followed by Wales and Spain. The pattern of loss rates differs from last year, when higher mortality and loss rates were found in central Europe and countries to the east. This year the higher loss rates tend to be in the west and northern countries, although Spain had high rates of loss in both years. All the loss rates quoted here include losses due to unresolvable queen problems after winter, as well as colonies that died over winter for various reasons. Losses due to queen problems were unexpectedly high in some countries and this will be a matter of further investigation."*

The protocol used to collect this COLOSS data has been internationally standardized[2,3] to allow comparisons and joint analysis of the data. A more detailed analysis of risk factors calculated from the whole dataset , as well as further colony loss data from other countries, will be published later in the year.

Romée van der Zee of the COLOSS Core project for colony losses monitoring says: *"Spring and early summer (March-July) were cold in Norway, Scotland, Sweden, Denmark and Ireland, with mean temperatures ranging from 12.8 - 14.4 °C. This may have had negative effects on colony development, resulting in both relatively high numbers of dead colonies and unsolvable queen problems after winter. A more detailed analysis may reveal the effects of other important factors, such as the role of the honey bee parasite* Varroa destructor."

[Ends]

cost
EUROPEAN COOPERATION
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Ricola Foundation
Nature & Culture

Varroa Autumn treatment
(Apiguard® Application method)

Commencement of treatment

After 2 weeks

Until the container is empty or 8 weeks

Varroa Autumn treatment (MAQS® Application method)

Remove 2 MAQS from the plastic, do not remove paper wraps

Lay strips across the top bars, about 5cm between strips and 10cm between the end of the brood chamber

Treatment time = 7 days

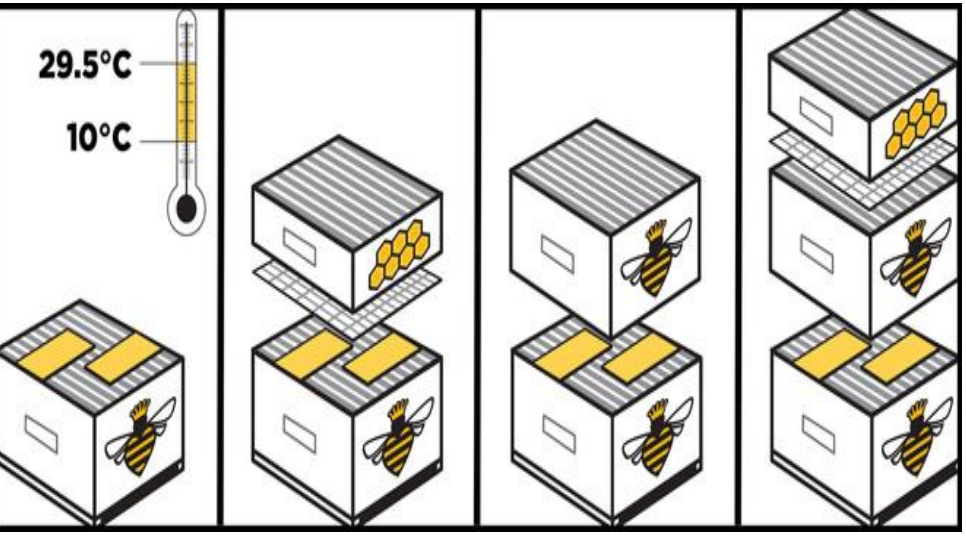


Diagram taken from NOD webpage

- **Use on full colonies only**
- **Open the hive entrance full**
- **If honey is extracted place empty super over brood box**
- **Do not disturb or feed during treatment**

Possible Adverse Effects: (according to the manufacturers)

Bearding behaviour

Initial egg and young brood loss

Some bees and queens proving susceptible to the formic acid vapours

Varroa winter treatment
(ApiBioxal Application methods)

Trickling method

Vaporiser method

Important to note:

Protective clothing should be worn when applying the acid by any of the above methods. Items required include:

- **Mask (FFP 3 S/L)**
- **Gloves**
- **Goggles**
- **long sleeved top**

Safety kits are available from most beekeeping suppliers

ApiBioxal: Trickling Method

Step 1: Put on safety clothing:
Goggles, FFP3/S/L mask, long sleeve top and rubber gloves

Step 2: Preparation of 1:1 sugar solution:
Weigh 1kg of water + 1kg of sugar
(1:1 sugar solution by weight) (volume=1670ml)

Step 3: Prepare the final solution of Apibioxal
Measure out 500mls of this solution and add the 35g of Apibioxal (full sachet).

Step 4: Transport of treatment to the apiary
Ensure that the treatment is transported in a sealed container and is kept in an upright position

Trickling Procedure

5ml per bee space is trickled using syringe

- **Have brace comb removed**
- **Keep mixture at 37C approximately**

A full colony treatment would require

20-25ml small colonies

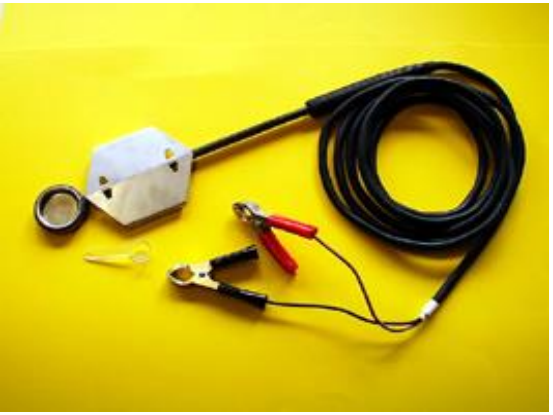
25-30 ml medium colonies

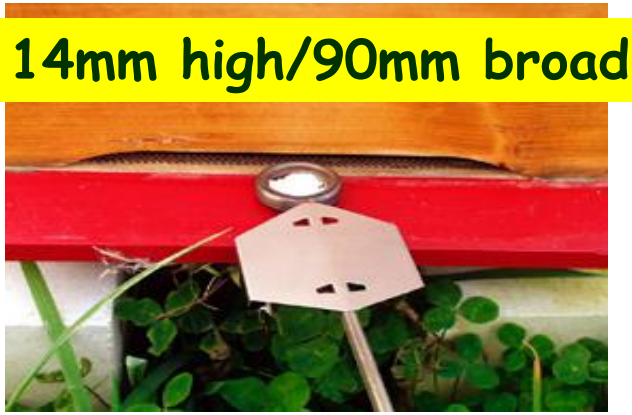
30-35 ml large colonies

Vaporiser Method

Protective clothing similar should be worn

Ambient temperature should be above 2°C





Leave colony sealed for a further 10mins

Acknowledgements

For continued funding from
DAFM / EU under the
National Apiculture Programmes
2007 – 2010; 2010 – 2013; 2013 – 2016

Federation of Irish Beekeepers Association

Beekeepers who routinely submit samples as part of the National Survey on disease prevalence and complete the annual survey on winter colony losses

but especially you for listening this evening

Thank you!

Contact me:
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