

Survey of Insect Pollinator Use for Horticultural Crops in Korea



2019. 9. 10.

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TIME

A WORLD WITHOUT BEEES



THE PRICE WE'LL
PAY IF WE DON'T
FIGURE OUT
WHAT'S KILLING
THE HONEYBEE

BY BRYAN WALSH



Genome pioneer J. Craig Venter's excellent adventure: "We're finding 40,000 new species in a barrel of seawater." PAGE 8



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ENVIRONMENT • POLITICS • PEOPLE

WINNER
GENERAL
CATEGORIES
OF THE
RESISTANCE
POSS AWARDS
2013



THE CRISIS YOU DON'T KNOW ABOUT
THE VANISHING BEE
THIS VITAL POLLINATOR IS IN GRAVE DANGER. SO IS YOUR FOOD SUPPLY.
WHY SOMETHING SO SMALL MATTERS SO MUCH

JULY 2013 | ADVOCATEMAG.COM

ADVOCATE

BE LOCAL IN LAKE HIGHLANDS

GOODNIGHT, SWEET BEE

[100,000,000 B.C. - 2014?]



THE LOCAL PUSH TO SAVE THE POLLINATOR
POPULATION FROM EXTINCTION

Declining bee population → Decline of food production



Economic valuation of insect pollinator



The economic value of pollination for 100 crops used for human food worldwide : € 153 billions (2005)

- About 9.5% of the total value of the production of human food worldwide
- **Disappearance of insect pollinators: € 191-310 billions** of social surplus losses (Nicola Gallai et al., 2009, Ecological Economics)



75% of crops worldwide are partially depended on insect pollinators.

- **Annual production of \$2,350-5,770 billions (5-8%)** is directly related to the contribution of insect pollinators (IPBES, 2016)

Materials & Methods













-  **Survey area:** 156 agricultural technology centers in entire 8 provinces of Korea.
-  **Survey subjects:** Farmers, insect pollinator companies, and etc.
-  **Survey period:** 05JAN2017 - 30MAY2017 (5 months)
-  **Survey method:** On-site visits, telephone, e-mail, and etc.
-  **Survey contents:** Farm numbers and rate of insect pollinators use for horticultural crops, different kinds of insect pollinators, and etc.

Table 1. The usage rate and farm number of insect pollinators use for 26 horticultural crops in 2016





Crops	Cultural area (ha)	Area of insect pollinators use (ha)	Rate of insect pollinators use (%)	Farm numbers of insect pollinators use
Water melon	12,572	8,152.5	64.8	11,076
Tomato	6,976	4,436.4	63.6	8,154
Strawberry	6,306	6,299.0	99.9	14,851
Oriental melon	5,305	4,975.8	93.8	6,285
Pepper	4,878	1,550.8	31.8	3,274
Zucchini	3,396	52.8	1.6	114
Cucumber	3,338	7.0	0.2	25
Melon	1,546	1,279.5	82.8	2,308
Paprika	709	41.7	5.9	40
Bitter melon	115	1.4	1.2	15
Onion(seed)	55	55.0	100.0	52
Apple	31,620	5,773.5	18.3	5,399
Peach	16,704	27.1	0.2	41
Pear	12,664	336.3	2.7	320
Persimmon	11,849	1,656.5	14.0	1,976
Plum	5,920	21.0	0.4	56
Blueberry	4,290	161.1	3.8	349
Jujube	2,700	0.5	0.0	5
Korean raspberry	2,193	69.0	3.1	300
Kiwi	1,502	3.0	0.2	5
Pomegranate	537	5.4	1.0	3
Raspberry	350	84.0	24.0	326
Cherry	336	7.5	2.2	15
Boxthorn	134	6.0	4.5	109
Mango	42	41.9	100.0	104
Passion fruit	11	0.6	5.5	6
Total: 26	136,048	35,045.3	25.8	55,208

Table 2. colony numbers of insect pollinators use for 26 horticultural crops in 2016

Crops	Colony numbers of insect pollinators					Total
	Honeybees 	Bumblebees 	Masonbees 	HB, BB & MB   	Flies 	
Water melon	167,791	24				167,815
Tomato	77	100,692				100,769
Strawberry	81,519	5,816		6,299		93,634
Oriental melon	54,673			77		54,750
Pepper	6,802	4,658		4,497		15,957
Zucchini	393	133				526
Cucumber		168				168
Melon	13,332	1,258				14,590
Paprika		225				225
Bitter melon	20					20
Onion(seed)					833	833
Apple	10,769	5,266	2,410	698		19,143
Peach	66	25				91
Pear	2,134		5			2,139
Persimmon	3,705	238				3,943
Plum	42					42
Blueberry	771	546		480		1,797
Jujube	8					8
Korean raspberry	696					696
Kiwi	50					50
Pomegranate	39					39
Raspberry	1,420					1,420
Cherry	30					30
Boxthorn	312					312
Mango	26	55			484	565
Passion fruit	15					15
Total	344,690 (71.9)	119,104 (24.8)	2,415 (0.5)	12,051 (2.5)	1,317(0.3)	479,577





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Table 3. Cultural area and rate of insect pollinators use for 11 vegetable crops in 2016

Vegetable crops	Cultural area (ha)	Area of insect pollinators use (ha)					Rate of insect pollinators use (%)	
		Total	Honey-bees 	Bumble-bees 	Honeybee & Bumblebees 	Flies 	2016	2011
Water melon	12,572	8,152.5	8,151.5	1.0	0.0	0.0	64.8	45.8
Tomato	6,976	4,436.4	1.7	4,434.7	0.0	0.0	63.6	40.4
Strawberry	6,306	6,299.0	5,561.8	291.8	445.4	0.0	99.9	99.9
Oriental melon	5,305	4,975.8	4,970.9	0.0	4.9	0.0	93.8	81.2
Pepper	4,878	1,550.8	635.5	465.9	449.4	0.0	31.8	35.4
Zucchini	3,396	52.8	23.1	29.7	0.0	0.0	1.6	5.3
Cucumber	3,338	7.0	0.0	7.0	0.0	0.0	0.2	0.0
Melon	1,546	1,279.5	1,168.1	111.4	0.0	0.0	82.8	38.4
Paprika	707	41.7	0.0	41.7	0.0	0.0	5.9	15.2
Bitter melon	115	1.4	1.4	0.0	0.0	0.0	1.2	-
Onion(seed)	55	55.0	0.0	0.0	0.0	55.0	100.0	-
Total	45,194	26,851.9 (100%)	20,514.1 (76.4%)	5,383.2 (20.0%)	899.6 (3.4%)	55.0 (0.2%)	59.4	48.4

Results-4

Table 4. The **farm numbers** of insect pollinators use for 11 vegetable crops in 2016

Vegetable crops	Farm numbers of insect pollinators use				
	Total	Honeybees 	Bumblebees 	Honeybee & Bumblebees 	Flies 
Water melon	11,076	11,065	11	0	0
Tomato	8,154	5	8,149	0	0
Strawberry	14,851	12,928	693	1,230	0
Oriental melon	6,285	6,276	0	9	0
Pepper	3,274	1,221	1,056	997	0
Zucchini	114	80	34	0	0
Cucumber	25	0	25	0	0
Melon	2,308	2,020	288	0	0
Paprika	40	0	40	0	0
Bitter melon	15	15	0	0	0
Onion(seed)	52	0	0	0	55
Total	46,194 (100%)	33,610 (72.8%)	10,296 (22.3%)	2,236 (4.8%)	55 (0.1%)

Results-5

Table 5. The **colony numbers** of insect pollinators use for 11 vegetable crops in 2016





Vegetable crops	Colony numbers of insect pollinators				
	Total	Honeybees 	Bumblebees 	Honeybee & Bumblebees 	Flies 
Water melon	167,815	167,791	24	0	0
Tomato	100,769	77	100,692	0	0
Strawberry	93,634	81,519	5,816	6,299	0
Oriental melon	54,750	54,673	0	77	0
Pepper	15,957	6,802	4,658	4,497	0
Zucchini	526	393	133	0	0
Cucumber	168	0	168	0	0
Melon	14,590	13,332	1,258	0	0
Paprika	225	0	225	0	0
Bitter melon	20	20	0	0	0
Onion(seed)	833	0	0	0	833
Total	449,287 (100%)	324,607 (72.2%)	112,974 (25.1%)	10,873 (2.4%)	833 (0.2%)

Table 6. Cultural area and rate of insect pollinators use for 15 fruit tree crops in 2016








Fruit tree crops	Cultural area (ha)	Area of insect pollinators use (ha)						Rate of insect pollinators use (%)	
		Total	Honeybees 	Bumblebees 	Masonbee 	Honeybee, Bumblebees & Mason-bee   	Flies 	2016	2011
Apple	31,620.0	5773.5	3,295.3	1,680.2	633.0	165.0	0.0	18.3	17.8
Peach	16,704.0	27.1	23.1	4.0	0.0	0.0	0.0	0.2	1.9
Pear	12,664.0	336.3	331.6	0.0	4.7	0.0	0.0	2.7	23.0
Persimmon	11,849.0	1,656.5	1,579.5	77.0	0.0	0.0	0.0	14.0	14.9
Plum	5,920.0	21.0	21.0	0.0	0.0	0.0	0.0	0.4	2.8
Blueberry	4,290.0	161.1	59.8	25.3	0.0	76.0	0.0	3.8	23.2
Jujube	2,700.0	0.5	0.5	0.0	0.0	0.0	0.0	0.0	-
Korean raspberry	2,193.0	69.0	69.0	0.0	0.0	0.0	0.0	3.1	9.1
Kiwi	1,502.4	3.0	3.0	0.0	0.0	0.0	0.0	0.2	-
Pomegranate	536.5	5.4	5.4	0.0	0.0	0.0	0.0	1.0	-
Raspberry	350.0	84.0	84.0	0.0	0.0	0.0	0.0	24.0	-
Cherry	336.0	7.5	7.5	0.0	0.0	0.0	0.0	2.2	-
Boxthorn	134.0	6.0	6.0	0.0	0.0	0.0	0.0	4.5	-
Mango	41.9	41.9	4.0	2.3	0.0	0.0	35.5	100.0	-
Passion fruit	10.9	0.6	0.6	0.0	0.0	0.0	0.0	5.5	-
Total	90,851.7	8,193.4 (100%)	5,490.3 (67.0%)	1,788.8 (21.8%)	637.7 (7.8%)	241.0 (2.9%)	35.5 (0.4%)	9.0	14.1

Table 7. The farm numbers of insect pollinators use for 15 fruit tree crops in 2016















Fruit tree crops	Farmer numbers of insect pollinators					
	Total	Honeybees 	Bumblebees 	Mason-bee 	Honeybee, Bumblebees & Mason-bee   	Flies 
Apple	5,399	2,995	1,595	626	183	0
Peach	41	35	6	0	0	0
Pear	320	315	0	5	0	0
Persimmon	1,976	1,882	94	0	0	0
Plum	56	56	0	0	0	0
Blueberry	349	149	78	0	122	0
Jujube	5	5	0	0	0	0
Korean raspberry	300	300	0	0	0	0
Kiwi	5	5	0	0	0	0
Pomegranate	3	3	0	0	0	0
Raspberry	326	326	0	0	0	0
Cherry	15	15	0	0	0	0
Boxthorn	109	109	0	0	0	0
Mango	104	12	9	0	0	83
Passion fruit	6	6	0	0	0	0
Total	9,014 (100.0%)	6,213 (68.9%)	1,782 (19.8%)	631 (7.0%)	305 (3.4%)	83 (0.9%)

Table 8. The colony numbers of insect pollinators use for 15 fruit tree crops in 2016

Fruit tree crops	Colony numbers of insect pollinators					
	Total	Honey-bees 	Bumble-bees 	Mason-bee 	Honeybee, Bumblebees & Mason-bee   	Flies 
Apple	19,143	10,769	5,266	2,410	698	0
Peach	91	66	25	0	0	0
Pear	2,139	2,134	0	5	0	0
Persimmon	3,943	3,705	238	0	0	0
Plum	62	62	0	0	0	0
Blueberry	1,797	771	546	0	480	0
Jujube	8	8	0	0	0	0
Korean raspberry	696	696	0	0	0	0
Kiwi	50	50	0	0	0	0
Pomegranate	39	39	0	0	0	0
Raspberry	1,420	1,420	0	0	0	0
Cherry	30	30	0	0	0	0
Boxthorn	292	292	0	0	0	0
Mango	565	26	55	0	0	484
Passion fruit	15	15	0	0	0	0
Total	30,290 (100.0%)	20,083 (66.3%)	6,130 (20.2%)	2,415 (8.0%)	1,178 (3.9%)	484 (1.6%)

Results-9

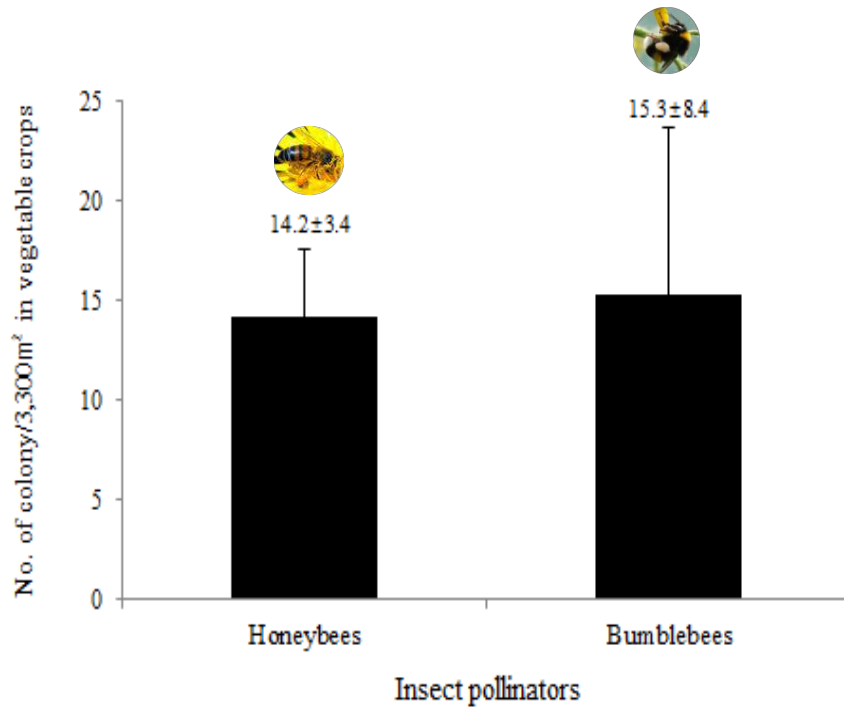


Fig. 1. The numbers of average colony of insect pollinators used per 3,300m² in vegetable crops. There was significant difference in the number of average colony between honeybees and bumblebees used per 3,300m² at T-test.

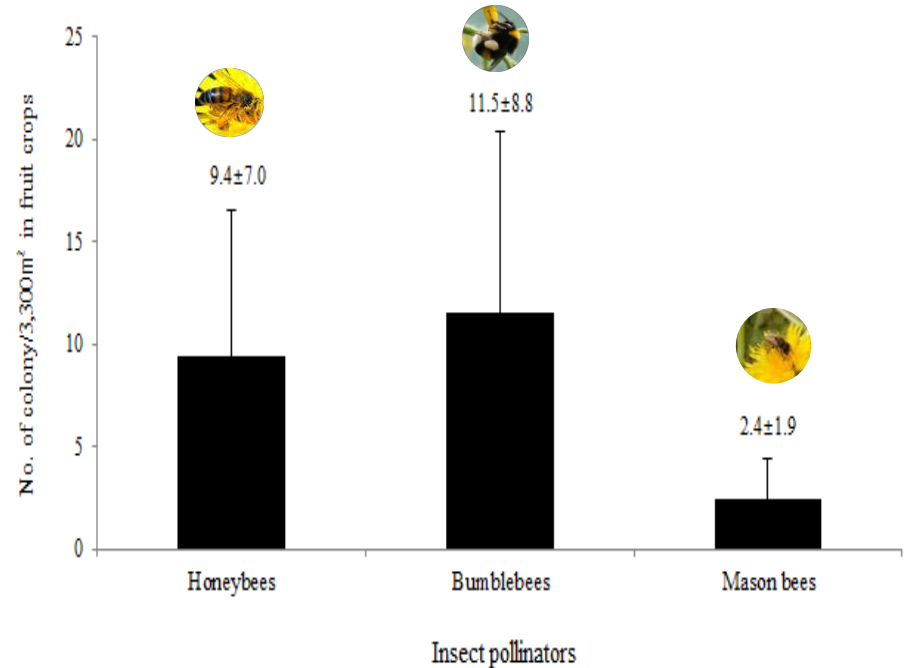


Fig. 2. The numbers of average colony of insect pollinators used per 3,300m² in fruit tree crops, 2016. There was significant difference in the number of average colony between honeybees and bumblebees used per 3,300m² at T-test.

Results-10

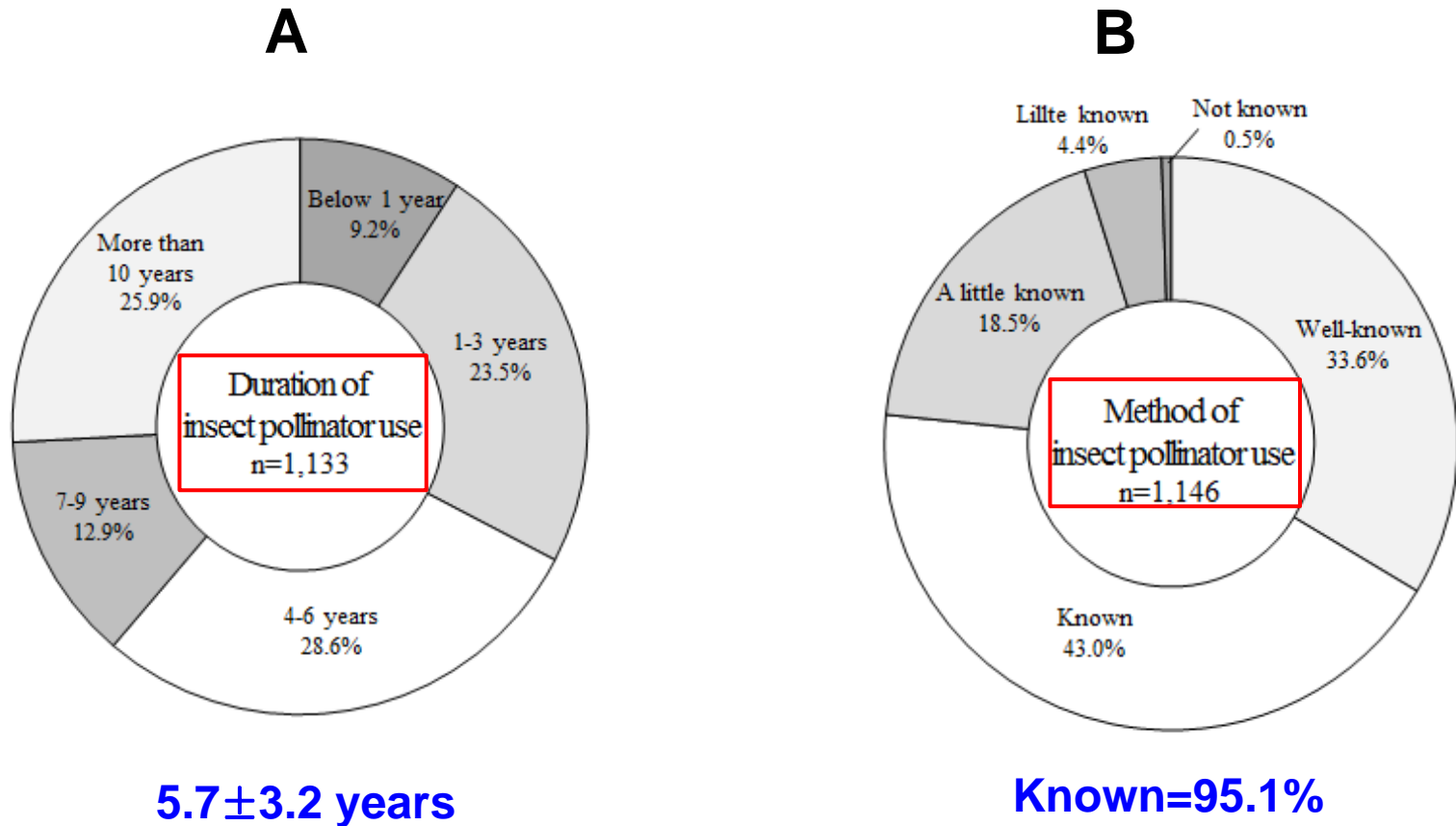


Fig. 3. Duration (A) and method (B) of insect pollinators use for 26 horticultural crops.

Results-11

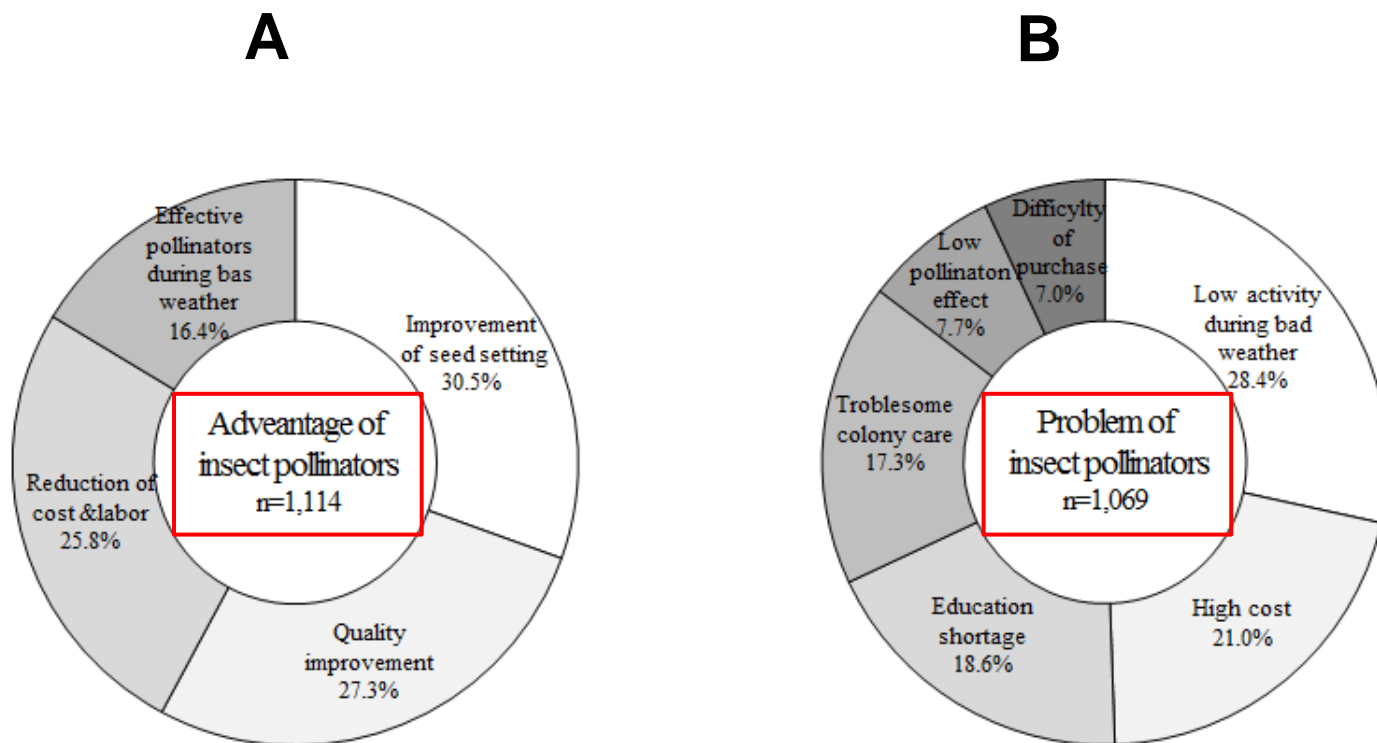


Fig. 4. Advantage (A) and problem (B) of insect pollinators use for 26 horticultural crops.

Results-12

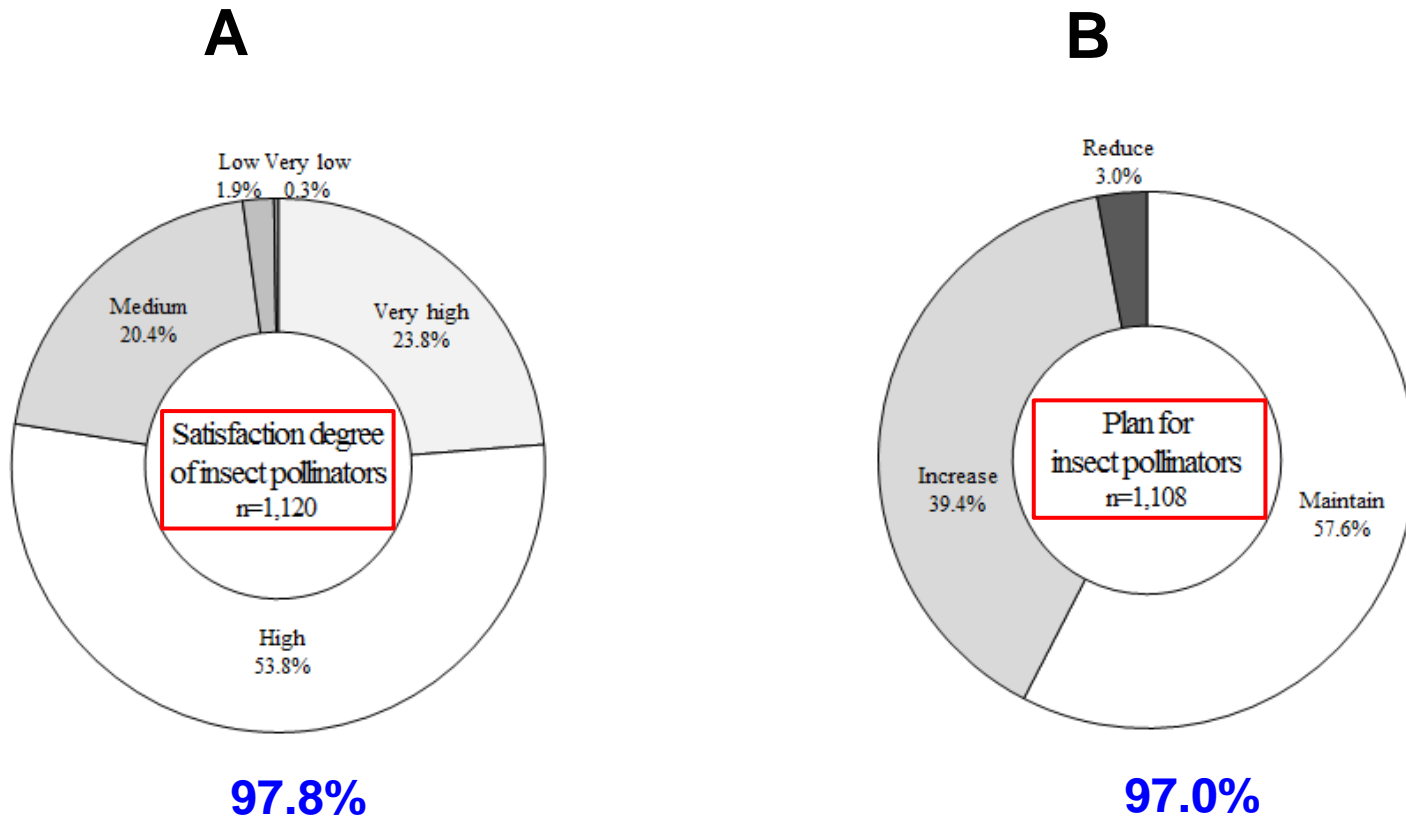


Fig. 5. Satisfaction degree (A) and plan (B) of insect pollinators use

Summary

We have surveyed the current status of insect pollinators use for horticultural crops in Korea, 2016.

- **The use rate and farm number of insect pollinators for 26 horticultural crops were 25.8% and 55,208, respectively.**
- **The colony number of insect pollinators used in this survey was 479,777.**
 . 344,690 for honeybees, 119,104 for bumblebees, 2,415 for mason bees, 1,317 for flies, and 12,051 for the combination of bumblebees, honeybees, and mason bees.
- **The use rate and colony number of insect pollinators were 59.4% and 449,287 for 11 vegetable crops.**
- **The use rate and colony number of insect pollinators were 9.0% and 30,290 for 15 fruit tree crops.**
- **Farms of 97.8% showed positive effect for the use of insect pollinators.**
- **Most of farms (97.0%) planed for the continuous use of insect pollinators.**