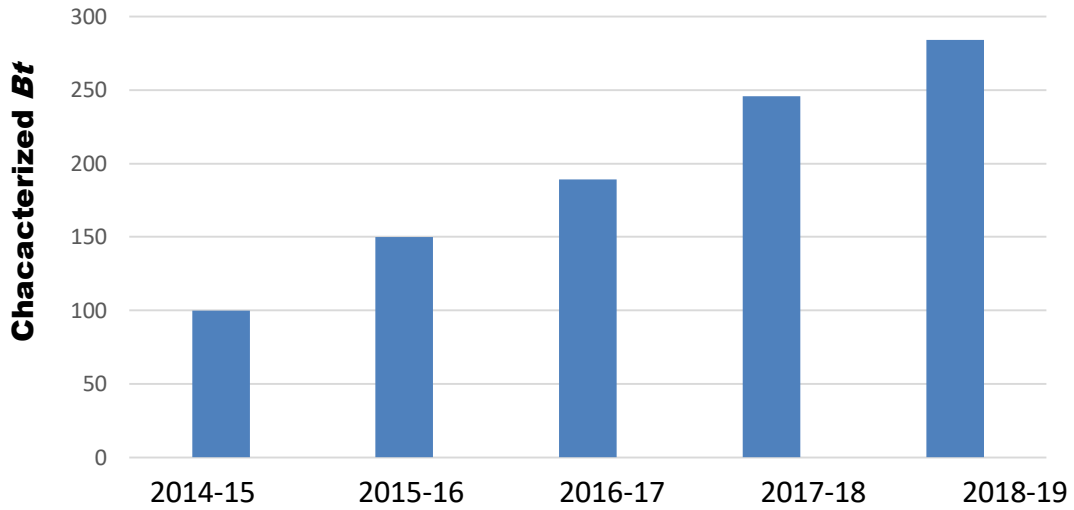
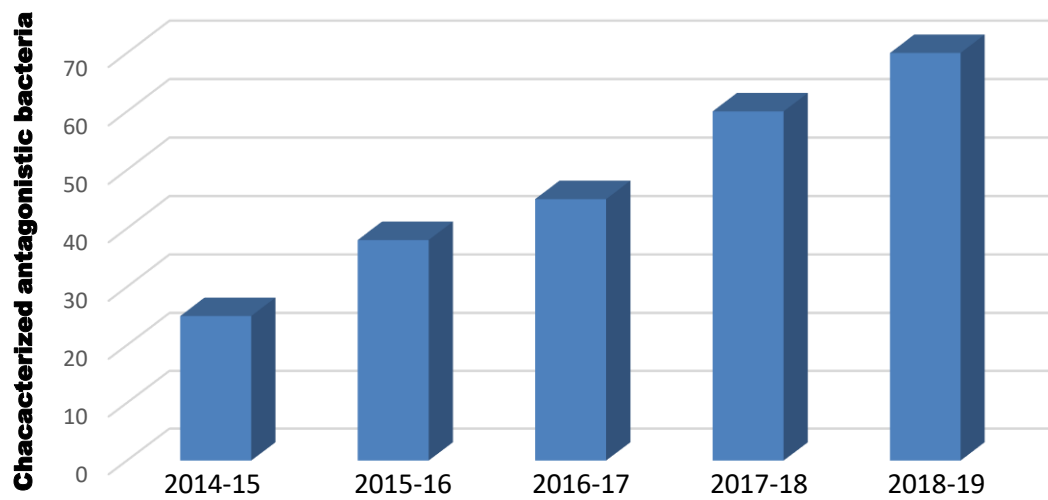


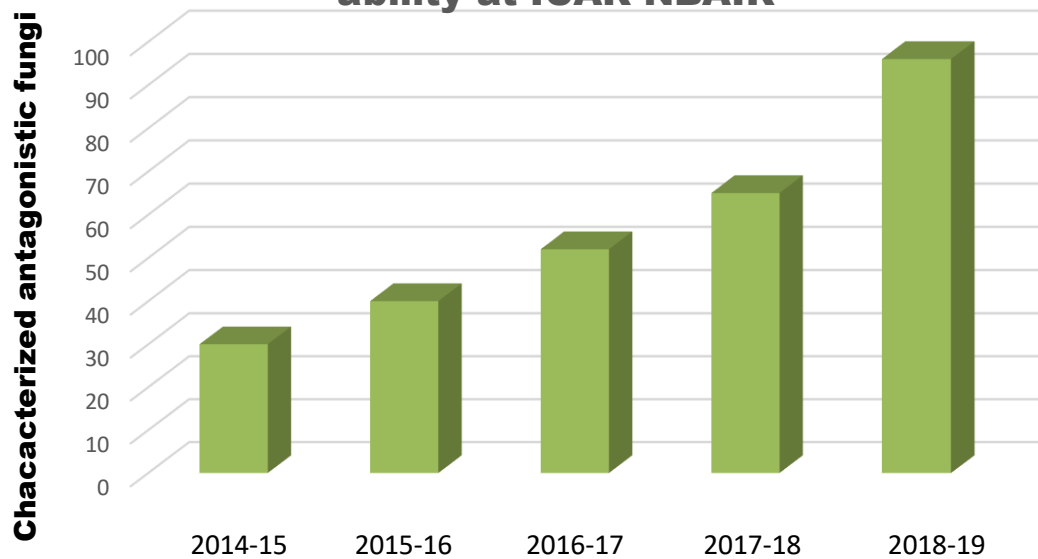
### Number of characterized *Bacillus thuringiensis* isolates at ICAR-NBAIR



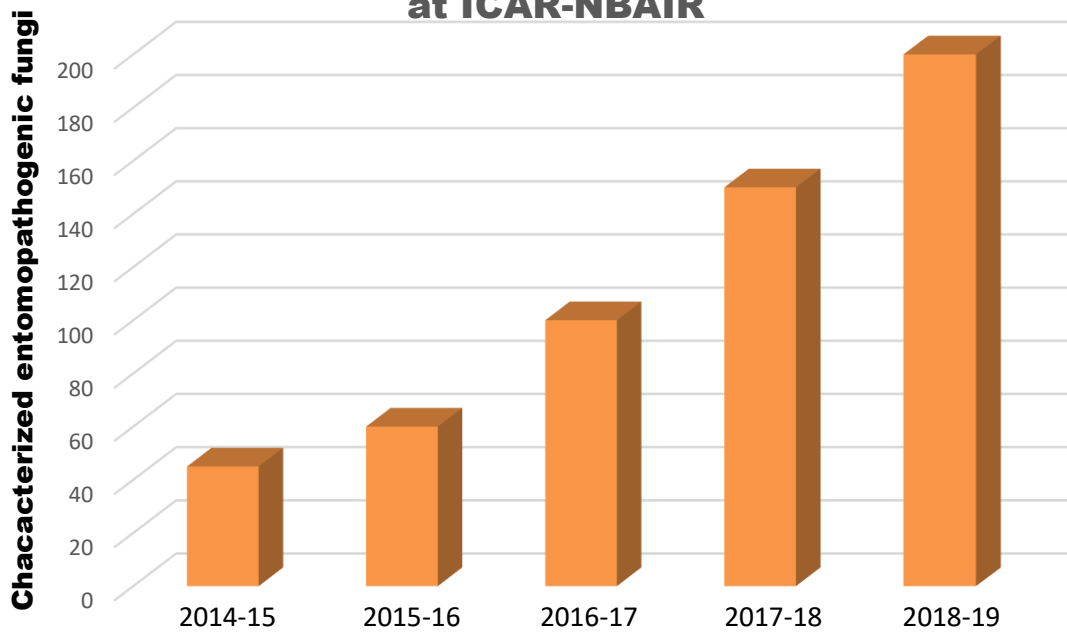
### Number of characterized antagonistic bacteria at ICAR-NBAIR



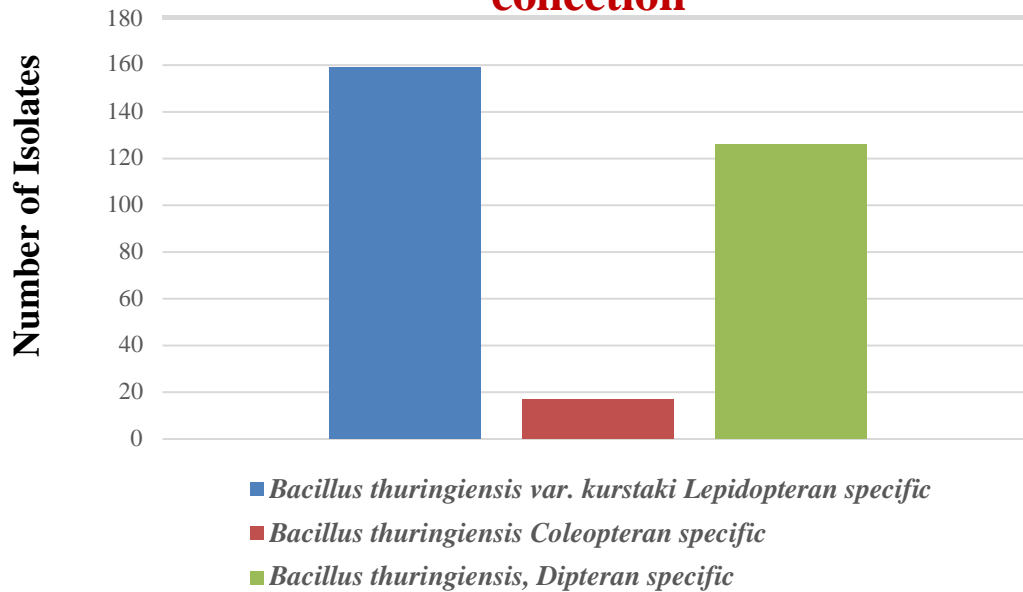
**Number of antagonistic fungi with biocontrol ability at ICAR-NBAIR**



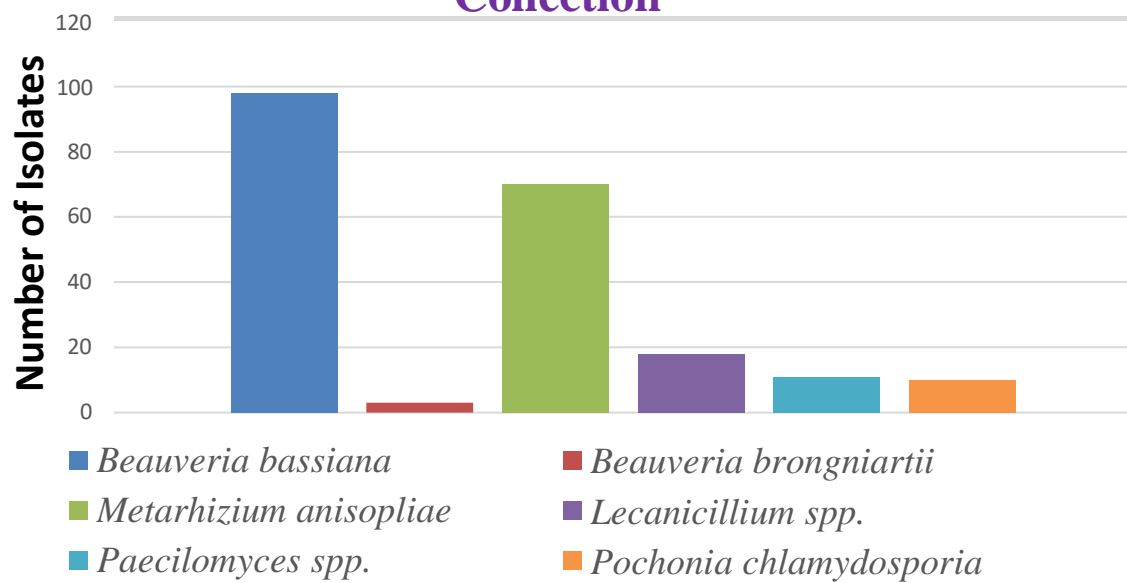
**Entomopathogenic fungi with bicontrol abiltiy at ICAR-NBAIR**



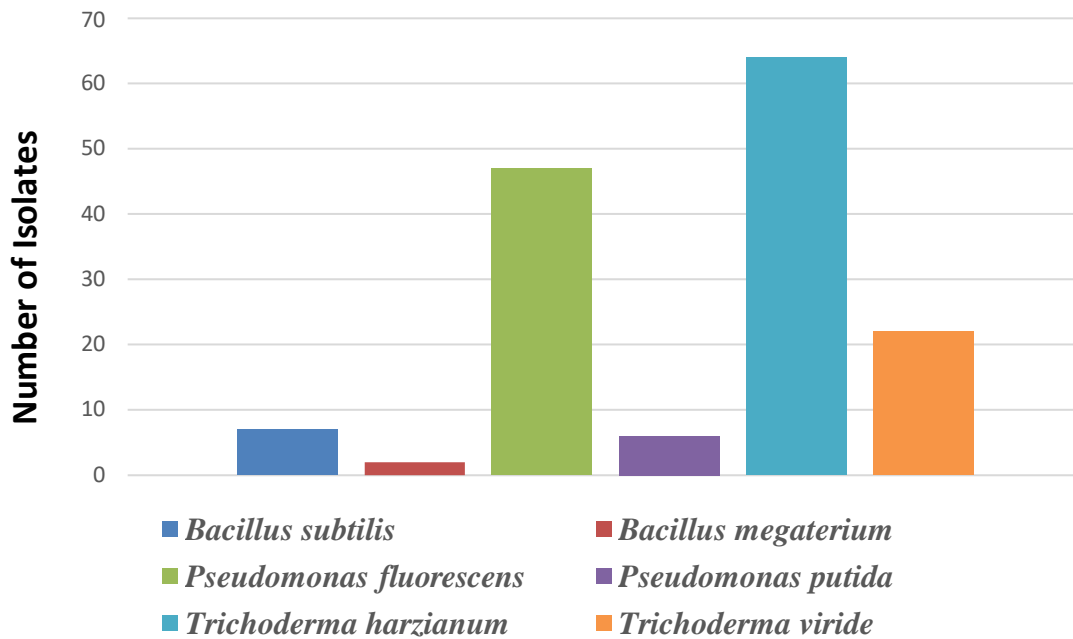
## ICAR-NBAIR *Bacillus thuringiensis* collection



## ICAR-NBAIR Entomofungal Pathogen Collection



## ICAR-NBAIR Antagonists Collection



### Cultures Maintained as repository

Entomopathogens		Numbers	Cry genes / characters
<b><i>Bacillus thuringiensis</i></b>			
1	<i>Bacillus thuringiensis</i> var. <i>kurstaki</i> Lepidopteran specific	159	Cry1Aa, Cry1Ab, Cry1Ac, Cry2Aa, , Cry1C, Cry1D, Cry2B, Cry1I, Cry5, Cry6, Cry7, Cry12, Cry14, Cry18, Cry19, Cry23, Cry28, Cry36, Cry47
2	<i>Bacillus thuringiensis</i> Coleopteran specific cry3	17	Cry3, Cry3A, Cry1Ia
3	<i>Bacillus thuringiensis</i> cry4, Dipteran specific	126	Cry4A, Cry4B, Cry4C, Cry4D, Cry10, Cry11, Cry16, Cry17
<b>Entomofungal Pathogens</b>			
4	<i>Beauveria bassiana</i>	98	Lepidopteran, Coleopteran and Sucking pests
5	<i>Beauveria brongniartii</i>	3	Lepidopteran, Coleopteran and Sucking pests
7	<i>Metarhizium anisopliae</i>	70	Lepidopteran, Coleopteran and Sucking pests
7	<i>Lecanicillium</i> spp.	18	Sucking pests
8	<i>Paecilomyces</i> spp.	11	Nematode control
9	<i>Pochonia chlamydosporia</i>	10	Nematode control

<b>Antagonists</b>			
10	<i>Bacillus subtilis</i>	7	PGPR and disease suppression
11	<i>Bacillus megaterium</i>	2	Phosphate solubilizer
12	<i>Pseudomonas fluorescens</i>	47	PGPR, ISR promoter, DAPG positive, disease suppressor
13	<i>Pseudomonas putida</i>	6	PGPR, ISR promoter, DAPG, antifungal
14	<i>Trichoderma harzianum</i>	64	Antifungal, ISR promoter
15	<i>Trichoderma viride</i>	22	Antifungal, ISR promoter

## CULTURABLE AND UNCULTURABLE MICROFLORA ASSOCIATED WITH SOIL INSECTS AND OTHER ARTHROPODS

### Identification of bacteria isolated from gut of *Protactia aurichalcea*

Sl no	Isolate	Identification	Gram character	Accession numbers
1	F2	<i>Bacillus pumulis</i>	Gram positive rods	KJ197180
2	F3	<i>Providencia</i> sp	Gram negative rods	KJ197181
3	F4	<i>Zobellella taiwanensis</i>	Gram positive rods	KJ197182
4	F5	<i>Pseudomonas</i> sp	Gram negative rods	KJ197183
5	F6	<i>Pseudomonas putida</i>	Gram negative rods	KJ197184
6	F8	<i>Proteus penneri</i>	Gram negative rods	KJ398213
7	F9	<i>Citrobacter koseri</i>	Gram negative rods	KJ398214
8	F10	<i>Myroides odoratimimus</i>	Gram negative rods	KJ398215
9	F11	<i>Bacillus altitudinis</i>	Gram positive rods	KJ398216
10	F12	<i>Proteus vulgaris</i>	Gram negative rods	KJ398218
11	F17	<i>Bacillus stratosphericus</i>	Gram positive rods	KJ398222
12	F18	<i>Bacillus amyloliquefaciens</i>	Gram positive rods	KJ398223
13	F20	<i>Bacillus cereus</i>	Gram positive rods	KJ398225
14	F22	<i>Shewanella algae</i>	Gram positive rods	KJ398227
15	F23	<i>Bacillus subtilis</i>	Gram positive rods	KJ398228
16	F27	<i>Paucisalibacillus globulus</i>	Gram positive rods	KJ398232
17	F30	<i>Acinetobacter colcoaceticus</i>	Gram negative rods	KJ398235
18	F31	<i>Flavobacterium</i> sp	Gram negative rods	KJ398236
19	C1	<i>Pseudoxanthomonas</i> sp	Gram positive rods	KJ997967
20	C2	<i>Bradyrhizobiaceae</i> sp	Gram positive rods	KM036499
21	C3	<i>Citrobacter</i> sp	Gram negative rods	KM036500

22	C4	<i>Citobacter koseri</i>	Gram negative rods	KM016946
23	C5	<i>Staphylococcus saprophyticus</i>	Gram positive cocci	KM016945
24	C6	<i>Bacillus cereus</i>	Gram positive rods	KM016944
25	C7	<i>Arthrobacter</i> sp	Gram positive rods	KM016943
26	C8	<i>Enterococcus pallens</i>	Gram positive cocci	KM016942
27	C9	<i>Bacillus pumilus</i>	Gram positive rods	KM405331
28	C10	<i>Bacillus amyloliquefaciens</i>	Gram positive rods	KM016928
29	C11	<i>Bacillus safensis</i>	Gram Positive rods	KM016929

### List of bacteria isolated from gut of *Oryctes rhinoceros*

Sl no	Isolate	Identification	Gram character	Accession numbers
1	FGG1	<i>Bacillus</i> sp	Gram positive rods	KM405334
2	FGG2	<i>Bacillus cereus</i>	Gram positive rods	KM101045
3	FGG3	<i>Agrobacterium</i> sp	Gram negative rods	To be assigned
4	HGG4	<i>Xylanimicrobium pachnodae</i>	Gram positive rods	KM101046
5	HGG5	<i>Bacillus</i> sp	Gram positive rods	KM101047
6	HGG6	<i>Rhizobium huautlense</i>	Gram negative rods	KM101048
7	HGG10	<i>Bacillus bombysepticus</i>	Gram positive rods	KM101049
8	HGG11	<i>Microbacterium phyllosphaerae</i>	Gram positive rods	KM101050
9	HGG12	<i>Bacillus cereus</i>	Gram positive rods	KM101051
10	HGG13	<i>Bacillus pumilus</i>	Gram positive rods	KM101052
11	HGG14	<i>Bacillus gibsonii</i>	Gram positive rods	To be assigned
12	HGG15	<i>Microbacterium aerolatum</i>	Gram positive rods	KM101053
13	HGG18	<i>Bacillus</i> sp	Gram positive rods	KM101054
14	HGG19	<i>Bacillus amyloliquefaciens</i>	Gram positive rods	KM101055
15	HGG20	<i>Microbacterium testaceum</i>	Gram positive rods	KM101056
16	HGG22	<i>Bacillus</i> sp	Gram positive rods	KM405335
17	HGG24	<i>Brevibacterium</i> sp	Gram positive rods	To be assigned
18	HGG25	<i>Bacillus pumilus</i>	Gram positive rods	To be assigned
19	OrF3	<i>Lysinibacillus sphaericus</i>	Gram positive rods	KM065515
20	OrF4	<i>Bacillus amyloliquefaciens</i>	Gram positive rods	KM065516
21	OrF5	<i>Bacillus cereus</i>	Gram positive rods	KM065517
22	OrF7	<i>Bacillus megatarium</i>	Gram positive rods	KM065518
23	OrF12	<i>Bacillus subtilis</i>	Gram positive rods	KM405332
24	OrF13	<i>Bacillus</i> sp	Gram positive rods	KM065519
25	OrM16	<i>Bacillus megatarium</i>	Gram positive rods	KM067910
26	OrM17	<i>Lysinibacillus sphaericus</i>	Gram positive rods	KM067911
27	OrM18	<i>Bacillus</i> sp	Gram positive rods	KM067912
28	OrM19	<i>Bacillus altitudinis</i>	Gram positive rods	KM067913
29	OrM21	<i>Bacillus marisflavi</i>	Gram positive rods	KM067914
30	OrM22	<i>Lysinibacillus sphaericus</i>	Gram positive rods	KM067915

31	OrM23	<i>Bacillus subtilis</i>	Gram positive rods	KM405333
32	OrM24	<i>Bacillus bombysepticus</i>	Gram positive rods	KM081629
33	OrH26	<i>Bacillus cereus</i>	Gram positive rods	KM081630
34	OrH27	<i>Bacillus tequilensis</i>	Gram positive rods	KM081631
35	OrH28	<i>Bacillus subtilis</i>	Gram positive rods	KM081632
36	OrH30	<i>Bacillus methylophilus</i>	Gram positive rods	KM081633

### Identification of bacteria isolated from gut of *Hermetia illucens*

Sl no	Isolate	Identification	Gram character	Accession numbers
1	BSFN5a	<i>Bacillus cereus</i>	Gram positive rods	To be assigned
2	BSFN5b	<i>Bacillus cereus</i>	Gram positive rods	To be assigned
3	BSFN5c	<i>Bacillus cereus</i>	Gram positive rods	KM368323
4	BSFM5e	<i>Brevibacterium epidermidis</i>	Gram positive rods	KM368324
5	BSFN5g	<i>Bacillus pumilus</i>	Gram positive rods	KM368325
6	BSFN7i	<i>Proteus mirabilis</i>	Gram negative rods	KM368326
7	BSFN7j	<i>Bacillus megatarium</i>	Gram positive rods	KM368327
8	BSFN7k	<i>Bacillus cereus</i>	Gram positive rods	KM394279
9	BSFN7l	<i>Bacillus flexus</i>	Gram positive rods	KM394280
10	BSFN1jm	<i>Staphylococcus saprophyticus</i>	Gram positive rods	KM394281
11	BSFN10n	<i>Microbacterium trichothecomytain</i>	Gram positive rods	KM394282
12	BSFN10o	<i>Bacillus cereus</i>	Gram positive rods	KM394283
13	BSFN12p	<i>Proteus mirabilis</i>	Gram negative rods	KM405328
14	BSFN12q	<i>Bacillus cereus</i>	Gram positive rods	KM405329
15	BSFN12r	<i>Geobacillus sterothermophilus</i>	Gram positive rods	KM405330

## Gut bacteria identified from dung beetles

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### Culturable microbes isolated from gut of *Oniticellus cinctus*

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Identification	Accession no.
<i>Acinetobacter baumannii</i> (OS5.1)	KX242271
<i>Staphylococcus saprophyticus</i> (OS5.2)	KX242270
<i>Enterobacter ludwigii</i> (OS5.4)	KX242269
<i>Enterobacter cloacae</i> (OS5.6)	KX242268
<i>Bacillus cereus</i> (OS8.2)	KX242264
<i>Ralstonia mannitolilytica</i> (OS8.6)	KX242263
<i>Kocuria koreensis</i> (OS10.6)	KX242261
<i>Stenotrophomonas maltophilia</i> (OS10.8)	KX242259

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### Culturable microbes isolated from gut of *Onitis philemon*

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Identification	Accession no.
<i>Acinetobacter baumannii</i> (OPNF5.3)	KT956227
<i>Morganella morganii</i> (OPNH5.6)	KT956232
<i>Aeromonas hydrophila</i> (OPNH5.10)	KT956230
<i>Citrobacter amalonaticus</i> (OPYH5.15)	KT956239
<i>Aeromonas caviae</i> (OPNH8.2)	KT956236
<i>Acinetobacter</i> sp.(OPMH8.8)	KT956225
<i>Providencia rettgeri</i> (OPMH8.10)	KT956234
<i>Providencia</i> sp. (OPMH8.14)	KT956224
<i>Citrobacter freundii</i> (OPNH10.3)	KT956228
<i>Aeromonas</i> sp. (OPMH10.8)	KT956223

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### Culturable microbes isolated from gut of *Onthophagus dama*

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Identification	Accession no.
<i>Bordetella avium</i> (DHN10.2)	KP984765
<i>Achromobacter marplatensis</i> (DHN10.3)	KP984766
<i>Bacillus aerophilus</i> (DHM10.4)	KX809598

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<i>Achromobacterxylosoxidans</i> (DMN8.4)	KT853099
<i>Bacillus tequilensis</i> (DFY8.16)	KT853100
<i>Achromobacter piechaudii</i> (DMN8.7)	KT853101
<i>Bacillus safensis</i> (DMN8.1)	KX809601
<i>Bacillus licheniformis</i> (DFN8.3)	KX809603
<i>Bacillus subtilis</i> (DMY8.15)	KT853098
<i>Bacillus pumilus</i> (DHN10.1)	KX809597

**Culturable microbes isolated from gut of *Oryctes rhinoceros***

<b>Identification</b>	<b>Accession no.</b>
<i>Bacillus amyloliquefaciens</i> (HGG19)	KM101055
<i>Lysinibacillus sphaericus</i> (OrF3)	KM065515
<i>Bacillus megatarium</i> (OrF7)	KM065518
<i>Bacillus tequilensis</i> (OrH27)	KM081631
<i>Staphylococcus saprophyticus</i> (OrH31)	KM081634
<i>Bacillus cereus</i> (FGG2)	KM101045

**MAPPING OF CRY GENE DIVERSITY IN THE NORTH EAST**

<b>SL NO</b>	<b>ISOLATE</b>	<b>GENE</b>	<b>ACCESSION #</b>
1	BTAN-4	Cry3a	KC416617
2	BTAN-5	Cry3a	KC416618
3	TRBT-10	Cry3a	KC416619
4	TRBT-17	Cry3a	KC416620
5	ASBT-21	Cry3a	KC416621
6	ASBT-20	Cry3a	KC416622
7	ASBT-24	Cry3a	KC416623
8	AGBT-4	Cry11	KC596019
9	AGBT-6	Cry11	KC596018
10	ASBT-12	Cry11	KC596015
11	TRBT-10	Cry11	KC596017
12	BT-3	Cry11	KC596016
13	FRBT-19	VIP3A	KC596007
14	ASBT-15	VIP3A	KC596008
15	BTD-2	VIP3A	KC596009

16	NE-60	VIP3A	KC596010
17	ASBT-25	VIP3A	KC596011
18	BTEG-1	VIP3A	KC596012
19	C3	VIP3A	KC596013
20	TRBT-10	VIP3A	KC596014