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Occurrence of white Grubs species associated with groundnut growing area of Junagadh district, part of South Saurashtra Region in Gujarat, India

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Abstract
The white grubs are destructive and troublesome insect pest all over the world. White grubs are called "Chaffer beetle" or "May- June beetle". White grubs have been defined as larvae of Melolonthidae. White grubs are root feeders and their Beetles feeds on the leaves of host plants. Their infestation has been reported throughout the country and magnitude of the problem has been widespread over the past years. South Saurashtra region of Gujarat is major groundnut growing area. The major white grub species associated with groundnut crop were surveyed in South Saurashtra, during May to October, 2017 and 2018. Adults were collected in the vicinities of the groundnut ecosystem by utilizing light traps with mercury light bulb as source. The survey revealed 23 species of Scarabaeidae. The incidence of white grub was commenced from 23rd Standard Meteorological Week (SMW) *i.e.*1st week of June and continued till 39th SMW (4th week of September) which ranged from 7 to 1784 beetles per trap per week. Disappearances of beetles were observed after the 4th week of September during the both consecutive years. The scarabaeid beetle's population attracted in light trap at Prabhatpur (6269) was lowest during 2017, while the highest beetles (10258) was recorded at Dhanfuliya during the year 2018.

Keywords: Occurrence, groundnut, white grub, south Saurashtra, Coleoptera scarabaeidae

Introduction
The Coleoptera: Scarabaeidae family is second largest family which includes more than 30,000 species (Khanal *et al.*, 2012) [7]. In India nearly 300 species of white grubs were recorded (Bhawane *et al.*, 2011) [2]. Generally the maximum numbers of white grubs from sub-family Melolonthinae and it was the most destructive and troublesome as soil insects (hidden enemy) in large area of Gujarat, Maharashtra, Karnataka, Rajasthan and Uttar Pradesh (Bhawane *et al.*, 2012) [3].

The white grub beetles are generally known as May-June beetles or Chaffer beetle because of their behavior of emergence during the month of May-June and the adults feed on leaves of host plants like as neem, acacia, ber, drumstick and Khijri etc.

The immature stage of the scarabaeid was known as white grubs or root grubs and these feed on underground roots and stems of host trees. In India there was more than 2000 species recorded, among them 40 species cause serious damage to an large numbers of host crop in field. White grubs also very serious pests of cereal crops such as maize, wheat, barley, jowar, bajra, oil seed crops like groundnut, sesame, sunflower, soyabean, vegetable crops like brinjal, cucurbit and bhendi and other commercial crops like sugarcane, cotton, tobacco etc (Veeresh *et al.*, 1991) [9].

Gupta and Avasthy, 1960 [5] very earlier reported the damage Duw to white grub in groundnut was reported in 1950s (*Holotrichia consang*uinea was the most dominant species that observed in severe form and caused extensive damage to groundnut and jowar in area of Amerli district of Gujrat (Desai and Patel, 1965) [4]. Fourteen species of white grubs were reported from groundnut crop in eastern Uttar Pradesh, of which Apogonia spp., Schizonycha ruficollis and Anomala ruficapilla being the most predominant (Nath and Singh, 1987) [8]. A total of 22 species from 9 genera were collected from groundnut ecosystem in South India (Wightman and Rao, 1994) [10]. In Saurashtra region the groundnut was major crop and the white grub was serious problem in field, very far study incidence and identification of white grub species associated with groundnut crop. So the present investigation carried out for the association of scarabaeid beetles with groundnut ecosystem.

Materials and Methods

White grub beetles are mostly active during the evening and night period, generally they emerge at evening after first shower of monsoon and immediately find the host trees for feeding and mating purpose. Sometime heavy attack of adult was defoliate the foliage of the host plants during night hours. White grub adult only feed on host trees. An investigation was carried out to study the incidence of scarabaeid beetles. The survey determine the species occurrence and diversity of scarabaeid beetles in the groundnut growing areas in three tehsil of Junagadh district of south Saurashtra during at the time of first monsoon rainy season. The activity of scarabaeid beetles were observed and recorded at weekly interval starting from month of April to October during the year 2017 and 2018.

During the survey, light traps were mounted at selected fields of each villages locating at different three tehsils of Junagadh district. To monitor the scarabaeid activity during *kharif* 2017 and 2018, one light trap per field was installed. Through the observations, it was felt that scarabaeids were attracted towards light trap in more numbers where the traps were installed nearby the host trees of scarabaeids. So, the traps were installed nearby host trees *i.e.,* neem (*Azadirichta indica*) and ber (*Zizyphus* spp.) which are situated on the hedges of the selected fields. The activity of scarabaeid beetles were observed and recorded at weekly interval starting from month of April to October during two consecutive years.

Results and Discussion

The present investigation carried out to monitoring white grub beetles. During this study the light traps were mounted at selected fields of each villages locating at different three tehsils of Junagadh district. To monitor the scarabaeid activity during *kharif* 2017 and 2018, one light trap per field was installed. Through the observations, it was felt that scarabaeids were attracted towards light trap in more numbers where the traps were installed nearby the groundnut ecosystem. The species diversity of groundnut ecosystem revealed 23 species *viz*., *Adoretus bicolor* Br., *Adoretus duvauceli* (Blanchard), *Adoretus lasiopygus* (Burmeister), *Adoretus punjabensis* (Arrow), *Adoretus testaceus* (Hope), *Adoretus versutus* (Harold), *Anomala bengalensis* (Blanchard), *Anomala dorsalis* (Febricius), *Anomala ruficapilla* (Bumeister), *Anomala rugosa* (Arrow), *Anomala varicolor* (Gylenhal), *Apogonia rauca* (Febricius), *Apogonia proxima* (Waterhouse), *Holotrichia consanguinea* (Blanchard), *Holotrichia fissa* (Brenske), *Holotrichia reynaudi* (Blanchard), *Holotrichia serrata* (Febricius), *Hybosorus* sp., *Maladera insanabilis* (Brenske), *Maladera* sp. Mulsant, *Peltonotus nasutus* (Arrow), *Phyllognathus dionysius* (Febricius) and *Schizoycha ruficollis* (Febricius) recorded. Similar finding observed by Kapadia *et al.,* 2006 [6] reported the fourteen species of white grubs from groundnut ecosystem of Saurashtra region, Gujarat. Whereas the Anitha *et al.,* 2006 [1] reported the major species associated with the groundnut cultivation at Andhra Pradesh.

The activity of scarabaeid beetles were observed and recorded at weekly interval starting from month of April to October during two consecutive years. The data indicated that the no beetles found in month of April and May during both the consecutive year.

The data indicated (Table 1) that the incidence of white grub was commenced from 23rd Standard Meteorological Week (SMW) *i.e.*1st week of June and continued till 39th SMW (4th week of September) which ranged from 7 to 1784 beetles per trap per week. The population of scarabaeid beetles fluctuated during the entire crop period. The appearance of scarabaeid beetles start from month of June just after the first pre monsoon rain, which was the indication for the emergence of scarabaeid beetles. In subsequent weeks, the population of scarabaeid beetles fluctuate from 30th SMW (month of July). Disappearances of beetles were observed after the 4th week of September during the both consecutive years.

Tehsil – Junagadh

From Anandpar village of Junagadh tehsil, the data on number of trapped beetles (Table 1) were ranged from 16 (39th SMW) to 753 (23rd SMW) per trap per week during the year 2017, while it was ranged from 36 (39th SMW) to 1057 (24th SMW) per trap per week during the year 2018.

In case of Mevasa (Bavana) village of Junagadh tehsil, the data on number of trapped beetles (Table 1) were ranged from 8 (39th SMW) to 927 (23rd SMW) per trap per week during the year 2017, while it was ranged from 7 (39th SMW) to 1024 (24th SMW) per trap per week during the year 2018.

Another village Prabhatpur of Junagadh tehsil, the data on number of trapped beetles (Table 1) were ranged from 18 (39th SMW) to 695 (27th SMW) per trap per week during the year 2017, while it was ranged from 21 (39th SMW) to 1178 (24th SMW) per trap per week during the year 2018.

The data of Junagadh tehsil indicated that (Table 1) the highest number of beetles (7812) were attracted in light trap at Anandpar village during the year 2018, while the lowest beetles (6269) were recorded at Prabhatpur village during the year 2017.

Tehsil – Vanthali

From Shapur village of Vanthali tehsil, the data on number of trapped beetles (Table 1) were ranged from 13 (39th SMW) to 824 (23rd SMW) per trap per week during the year 2017, while it was ranged from 26 (39th SMW) to 872 (24th SMW) per trap per week during the year 2018.

In case of Thanapipali village of Vanthali tehsil, the data on number of trapped beetles (Table 1) were ranged from 12 (39th SMW) to 881 (25th SMW) per trap per week during the year 2017, while it was ranged from 19 (39th SMW) to 1259 (25th SMW) per trap per week during the year 2018.

Another village Dhanfuliya of Vanthali tehsil, the data on number of trapped beetles (Table 1) were ranged from 29 (39th SMW) to 1375 (23rd SMW) per trap per week during the year 2017, while it was ranged from 12 (39th SMW) to 1426 (24th SMW) per trap per week during the year 2018.

The data of Vanthali tehsil indicated that (Table 1) the highest number of beetles (10258) were attracted in light trap at Dhanfuliya village during the year 2018, while the lowest beetles (6434) were recorded at Shapur village during the year 2018.

Tehsil – Visavadar

From Moti Monapari village of Visavadar tehsil, the data on number of trapped beetles (Table 1) were ranged from 20 (39th SMW) to 1251 (23rd SMW) per trap per week during the year 2017, while it was ranged from 46 (39th SMW) to 1784 (24th SMW) per trap per week during the year 2018.

In case of Nani Pindakhai village of Visavadar tehsil, the data on number of trapped beetles (Table 1) were ranged from 57 (39th SMW) to 841 (27th SMW) per trap per week during the year 2017, while it was ranged from 37 (39th SMW) to 976

(25th SMW) per trap per week during the year 2018.

Another village Baradiya of Visavadar tehsil, the data on number of trapped beetles (Table 1) were ranged from 34 (39th SMW) to 719 (25th SMW) per trap per week during the year 2017, while it was ranged from 20 (39th SMW) to 1343 (25th SMW) per trap per week during the year 2018.

The data of Visavadar tehsil indicated that (Table 1) the highest number of beetles (9826) were attracted in light trap at Moti Monpari village during the year 2018, while the lowest beetles (6668) were recorded at Baradiya village during the year 2017.

Summary and Conclusion

The results found from the occurrence of white grub was commenced from 23rd Standard Meteorological Week (SMW) *i.e.*1st week of June and continued till 39th SMW (4th week of September) which ranged from 7 to 1784 beetles per trap per week. Disappearance of beetles were observed after the 4th week of September during the both consequitive years.

The scarabaeid Beetles population at Junagadh tehsil indicated that the highest number of beetles (7812) was attracted in light trap at Anandpar village during the year 2018, while the lowest beetles (6269) was recorded at Prabhatpur village during the year 2017. However the Vanthali tehsil indicated that the highest number of beetles (10258) was attracted in light trap at Dhanfuliya village during the year 2018, while the lowest beetles (6434) was recorded at Shapur village during the year 2018. In Visavadar tehsil the highest number of beetles (9826) was attracted in light trap at Moti Monpari village during the year 2018, while the lowest beetles (6668) was recorded at Baradiya village during the year 2017.

Table 1: Monitoring the activity of scarabaeids beetles through light trap

Standard Meteorological Week	Number of beetles caught per trap																	
	Junagadh tehsil						Vanthali tehsil							Visavadar tehsil				
	Anandpar		Mevasa Bavana		Prabhatpur		Shapur		Thanapipali		Dhanfuliya			Moti Monpari	Nani Pindakhai		Baradiya	
	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018
23	753	349	927	216	661	198	824	241	827	142	1375	231	1251	214	801	178	694	237
24	658	1057	778	1061	648	1178	754	872	834	1127	1239	1426	983	1784	623	954	574	1241
25	749	910	795	978	615	906	781	795	881	1259	952	1279	945	1450	768	976	719	1343
26	525	848	439	848	501	823	525	784	328	990	586	1302	779	1199	541	885	564	1089
27	578	986	606	965	695	617	634	594	746	1047	1039	1047	667	1128	841	847	591	1174
28	591	352	512	541	623	537	612	547	784	739	890	652	636	298	695	865	629	483
29	395	322	402	235	278	294	395	236	315	395	649	783	261	376	326	264	435	596
30	501	873	623	792	540	681	623	674	590	758	826	1102	501	952	520	873	607	946
31	312	398	357	598	437	361	329	502	387	857	596	871	521	746	373	730	427	711
32	298	341	312	301	218	275	298	241	298	408	468	505	339	532	327	361	325	431
33	247	298	302	258	226	198	274	234	269	286	298	459	316	351	288	324	233	257
34	201	291	201	145	209	178	241	164	175	201	201	124	179	324	224	219	221	209
35	120	236	87	103	88	150	137	67	140	57	74	49	112	86	130	59	98	63
36	172	241	237	267	285	212	161	202	117	203	213	266	98	194	234	394	215	249
37	124	182	184	249	138	61	112	86	93	88	85	94	101	81	176	128	189	78
38	89	92	26	29	89	46	74	69	51	60	89	56	89	65	112	107	113	49
39	16	36	8	7	18	21	13	26	12	19	29	12	20	46	57	37	34	20
Total	6329	7812	6796	7593	6269	6736	6787	6434	6847	8636	9609	10258	7798	9826	7036	8201	6668	9176

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