

Ant stings in military forces on three Persian islands of Abu-Musa, Greater Tunb and Lesser Tunb

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Abstract

Aims: Ants with the ability of biting and injecting venom to human body are called sting ants. This study was conducted to identify and determine the ant species and the prevalence of ant sting and related epidemiological factors in three Greater Tunb, Lesser Tunb and Abu-Musa islands, Iran.

Methods: This descriptive cross-sectional study was performed during Jan-July 2010 in Greater Tunb, Lesser Tunb and Abu-Musa islands on 318 military individuals who were selected by random sampling method. The ant collection was done by active hand-catch method. The ant sting prevalence and related epidemiological factors were determined by questionnaire. Data were analyzed by descriptive statistical methods including Chi-square test, Mann-Whitney test and Spearman and Gamma correlation.

Results: Sting ants in these islands were identified as *Pachycondyla sennaarensis* (Mayr, 1862) (Hymenoptera: Formicidae). The mean prevalence of ant stings was 70.1%. The seasonal incidence of sting in three islands had the same pattern and was more common in spring and summer. 84.4% of ant stings had occurred in limbs. The main symptoms caused by the ant stings include pain, severe itching and local inflammation and blisters in some cases.

Conclusion: Although ant stings in these islands is not much dangerous and does not lead to anaphylactic shock and death, ant stings prevalence is very high and the pain, itching and burning would cause discomfort for soldiers and reduce their efficiency. Therefore, preventive measures and control of these ants should be considered.

Keywords: Sting Ants, Persian Gulf, Military, Iran, Abu-Musa, Greater & Lesser Tunb

Introduction

Ants like bees and termites are social insects and form colonies. These insects are from the order (or taxonomy) of hymenoptera and the super-family of Formicidae and from the family of Formica. It has 21 subfamilies, 296 genuses, and more than 11,000 described species and has appeared on the earth in the middle of Cretaceous period in geology (between 130-110 million years ago) and has since evolved [1 and 2].

Ants are among the very successful groups of insects which have adapted and distributed in most ecological places in the dry areas of the earth and have almost spread worldwide. In terms of number, they are the most abundant soil inhabitants and have been able to enter human's living places. Many of whom have entered new regions due to human's commercial activities and the transference of materials and foodstuffs, plants and agricultural products [3].

Some of ants which are able to sting and inject venom to the human's body are called sting ants [4]. These ants are naturally aggressive and can attack human, livestock, wildlife and even electricity establishments, etc [5].

Ant stings are widespread in most places in the world and there are a variety of them in different places, which are known by different names, including fire ants. The origin and the place of spread of these sting ants are African countries. The genus *Pachycondyla* (Smith 1885) with more than 200 described species is one of the diverse groups of ants in the sub-family of Ponerinae and is mainly found in tropical and subtropical regions worldwide [2]. Some of the species in the genus of *Pachycondyla* have poisonous sting and most of them are predator and feed on other arthropods and use their poisonous sting to paralyze their prey [6].

The biting from sting ants is usually painful and is accompanied with a severe feeling of scratch and in

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some cases with blister and some other signs and symptoms and even in some cases, depending on the insect's type or the population, may cause effects such as grave allergy, anaphylaxis shock, and even death [2, 7].

The existence of sting ants in Arabian countries lying on the precincts of Persian Gulf has been confirmed and their existence in Saudi Arabia peninsula and Yemen was reported for the first time in 1881 and there have been reports from Kuwait, Qatar, Oman, Pakistan and Emirate in the following years [8, 9].

The existence of sting ants in Iran was reported for the first time in Lar city located in the south of Fars province and also in the southern cities of Sistan Baluchistan province [10, 11, 12, 13, 14]. In the next researches, sting ants were reported in Qeshm Island (Hormozgan province) [15].

With respect to the point that there were reports concerning soldiers being stung by ants in the on the three Persian islands, this research was done to determine the species of these ants, and to investigate the prevalence of being stung by sting ants and to obtain more information concerning the status of being stung in these islands.

Methods

The present study was a descriptive and cross-sectional study, lasting for 6 months during Jan-July 2010 in three Iranian islands of Greater and Lesser Tunb and Abu-Musa.

The study was done in two sections. First, indoor places and the precincts of military environments in which the soldiers faced ants; the sting ants were predated by soldiers and the information required was recorded through questionnaire so as to investigate the prevalence of being stung and the status of the people being stung.

Three islands of Greater and Lesser Tunb and Abu-Musa under investigation, in the expanse of Persian Gulf were located in the most southern point of Iran and are considered part of Hormozgan province. Abu-Musa island, with 25°51'-26°19' N and 54°26'-55°19' E is the most southern Iranian island located in Persian Gulf. This island is located within 222 kilometers from Bandar Abbas and is within 75 kilometers from Bandar Lengeh and its distance from Hormoz Strait is 160 kilometers. The vastness of Abu-Musa province is 68.8 square kilometers which includes Abu-Musa province (12 square kilometers), Greater Tunb Island (10.3 square kilometers), Lesser Tunb (2.1 square kilometer), Siri (17.3 square kilometers), Greater Farur (26.2 square kilometers) and Lesser Farur (1.5

square kilometers) [16]. Greater Tunb Island with 26°34'-26°30'N and 55°28'-55°34'E is located within 22.5 kilometers from the southwest of Qeshm (the Persian Gulf largest island), and is within 156 kilometers from Bandar Abbas city and is within 43.5 kilometers from the northeast of Abu-Musa Island. Lesser Tunb Island is triangle-shaped and locates within 15 kilometers from the west of Greater Tunb Island. Its distance from the center of Hormozgan province, the city of Bandar Abbas, is around 169 kilometers by the sea. The closest Iranian port (Bandar) to this is Khamir Bandar and Lengeh Bandar with a distance of 75 kilometers. The most elevated point in Lesser Tunb is a height of 35 meters from the sea level. Its ground is constituted from sand and in some places from rocks [16].

Collecting these ants in indoor places and their precincts has been done by the method of direct observance and hand catch. That is, along a day and indoor places such as military embankments, resting places, military and official centers and with the help of flashlight, the soldiers embarked on searching for this ant on the ground and when observing them, the ants were captured by forceps (pincers) or a piece of cotton submerged in chloroform or Ethyl Acetate was placed on the ants and after the lapse of a few seconds, leading to the ants' unconsciousness and motionlessness or the death, the sample was transferred to a vial filled with 75% alcohol, using forceps or wet paint brush. To capture the ants, the people residing in the region did also help who had the experience of facing these ants and were quite familiar with them. They were also captured in outdoor places, where these insects were more observable in the rather cold hours of the day, in the early morning and in the afternoon.

The captured samples were transferred to the laboratory and were recognized using the identification keys, description and valid details [2, 17]. Also the identification was confirmed by comparing their systematic characters with the collected samples in the previous researches, endorsed by Professor *Bolton* in Natural History Museum of London.

The realized questionnaire was used to collect the needed information concerning the prevalence rate of soldier's being stung and the investigation of the status of the people being stung. However, the previous experiences and questionnaires belonging to the previous researches were also used [13, 14, 15]. Eventually, a questionnaire consisting of 21 open and closed questions was prepared. The validity and reliability of questionnaire was assessed by expert

discussion group and pilot study.

To calculate sample volume, the formulae of determining sample volume for an unlimited society was used ($N=Z_{1-\alpha/2} pq/d^2$). In this calculation, with respect to the preliminary study which was done to estimate distribution, the P amount was estimated as 0.75 and the d amount was estimated as 0.05. The sample volume was taken 288 people and eventually, 318 military people (official personnel and those spending military services) were asked to complete the questionnaires in the three islands.

The questionnaire questions covered the obtain of information concerning the prevalence of being stung by ants, its numbers, the body member being stung, and the position and location of being stung, the rate and the season facing sting ant and the capability to recognize this ant among existing military people in the island.

It was also asked about ant-phobia (the excessive and psychological fear from the sting ant) among soldiers and that whether they wake up due to fear and imagination of being stung by ants during day and night sleep or that whether principally, they fear excessively from these ants.

To register signs and symptoms of being stung by sting ant, the issue of the sting and its status was inspected by the group's doctor and the related symptoms were recorded, in addition to the existing questions in the questionnaire which were asked from all those being stung and those being recently stung by the ants. During the study, it was advised to the soldiers that immediately refer to register signs and symptoms of the sting if they are stung, considering the fact that many of those being stung referred late, after the lapse of sometime (from several days to several months) and as such, it was not possible to measure precisely the wound or its form in all cases. To determine the ability to recognize the sting ants as an index to confirm the high encounter of the people under investigation with these ants in their living places, they were delivered a vial filled 75% with alcohol so as to embark on collecting sting ants and by doing so, it is possible to determine their ability in recognizing these ants, in addition to contributing to collecting samples.

To complete the questionnaire, each island is hypothetically divided into 5 sections of north, south, east, west and center. The selection of people was done randomly and in equal portions in different geographical directions. Some samples of sting ants were collected in all sections of the islands, and the

questionnaire was also completed.

Due to the military nature of the society under investigation, their demographical features were not investigated and reported.

To compare the prevalence of being stung in the three islands, Chi Square test was used. To determine correlation among the length of stay in the islands and the number of being stung, Spearman Correlation Coefficient was used. To compare the relation between the number of being stung and their fear of ants (ant-phobia), Mann Whitney test was used. Also, to compare the frequency of being stung in different parts of the body (hand, foot, etc.) and in different conditions (on the ground, on the bed, etc.), Chi Square was used. To find the relation between the number of being stung with the intensity of its main symptoms, i.e. pain and feeling of scratch, Gamma correlation coefficient was used.

Results

In total, 318 people enter the study in the three islands of Abu-Musa, Greater and Lesser Tunb. Their duration of stay in the islands (both official personnel and those spending military service) was determined averagely 11.7 ± 13.8 month. There was a significant correlation between the people's duration of stay in the islands and the numbers being stung (Spearman Correlation Coefficient=0.42; $p < 0.05$). That is, with the increase in length of stay and their service in the islands, the numbers being stung have also arisen.

86.2% of those participating in the study have previously observed the sting ant and 77.7% were able to recognize it precisely from other ants by direct observation. 10.4% had excessive fear from the sting ant (entomophobia or ant-phobia). But there was no significant relation between the numbers being stung and the ant-phobia (U Mann Whitney=4638; $p = 0.35$). In other words, with the increase in the numbers being stung, there happens no change in their fear from the sting ant.

The prevalence of being stung (at least once a year) by the sting ant in the three islands, in total, was estimated 70.1% (223 people). In terms of the prevalence of being stung, the three islands had no significant difference ($p > 0.05$; Table 1). Among the people suffering ant stings, around 80% were stung more than once a year and around 26% were stung more than 5 times in a year. Around 57% of those being questioned had been waken up at least once due to the sting of the ant (Table 1).

Table 1- The ant stings prevalence and the frequency of its numbers in the three islands of Abu-Musa, Greater and Lesser Tunb during 2009-2010 (Chi Square=5.3, Degree of freedom=6, p=0.51)

Islands	Total number questioned	Number of ant stings (percentage)	The number of times being stung annually (percentage)			
			Once	2-5 times	6-10 times	More than 10 times
Abu-Musa	133	95(71.4%)	19(20%)	51(53.7%)	18(18.9%)	7(7.4%)
Great Tunb	117	76(65%)	21(27.6%)	36(47.4%)	15(19.7%)	4(5.3%)
Lesser Tunb	68	52(76.5%)	10(19.2%)	26(50%)	15(28.8%)	1(1.9%)
Sum	318	223(70.1%)	50(22.4%)	113(50.7%)	48(21.5%)	12(5.4%)

In this study, 9.4% (21 people) of the people being stung referred to the medical caring section and were treated on-the-spot. According to the reports of hospitals and military medical caring section located in the islands, there have been no observations or records of cases leading to the hospitalization, illnesses and shock or death from the ant's sting in these three islands.

In these islands, sting ants are extremely widespread in spring and summer and there is less in winter and autumn. The estimation of the numbers being stung in different seasons confirms this, since around 90% of the cases of being stung have happened in spring and summer and minimize in winter and autumn (Table 2). The seasonal prevalence of being stung in the three islands had a similar pattern and has no significant difference (p>0.05).

Table 2- The seasonal prevalence of ant stings in the three islands of Abu-Musa, Greater and Lesser Tunb during 2009-2010 (Chi Square=2.45, Degree of freedom=2, p=0.29)

Season	The percentage of ant stings (the number)
Spring	52.1%(116)
Summer	38.1%(85)
Autumn	2.7%(6)
Winter	2.7%(6)
Unknown	4.4%(10)
Overall	100%(223)

Registering signs and symptoms of being stung was done through the completion of the questionnaire from those had previously been stung and also, through observing and inspecting those who have recently been stung. During this study, 11 people of soldiers who at the same time were stung by the sting ants referred to register signs and symptoms.

According to the observations in this study, along with the ant's sting, there has been a grave pain in the place being stung during its early moments. Immediately, a severe feeling of scratch in the place begins which is followed by the formation of vesicle which gradually swells and the place being stung goes red and inflames. The place being stung becomes, a few minutes after being stung, inflamed to a large extent (with a diameter of between 3 and 10 centimeters and sometimes more) and becomes swollen in some cases

and eventually, in some cases, it turns into a blister (pustule) after the lapse of one or several hours. The excessive scratching of the place leads to its inflammation and in some cases lead to its being injured. According to the soldiers' statements, severe feeling of scratch exists along with itching and a rather severe pain in the place being stung. Constant scratching in some cases will lead to the creation of a wound and the remaining of a scar in the place (Table 3).

Table 3- The frequency of symptoms and signs of ant stings in the three islands of Abu-Musa, Greater and Lesser Tunb during 2009-2010 (p=0.99, Gamma Correlation=0.001)

*Signs and symptoms	Absolute frequency	Relative frequency
Only scratch	68	30.5%
Only itching	7	3.1%
Itching and scratching	19	8.5%
Scratch and blister	56	25.1%
Scratching, blister and itching	24	10.8%
Scratching and wound	15	6.7%
Scratching, blister, itching and wound	12	5.4%
Without symptoms	22	9.9%
Overall	223	100%

*All cases have inflammation and swelling

In this study, 90% of the people being stung suffered severe or extreme feeling of scratch, immediately after being stung by the ant and only about 10% of them suffered from slight feeling of scratch or had no feeling of scratch. Therefore, a severe pain during being stung and the following severe or extreme feeling of scratch in the place being stung are among the most important features of these ants' stings. Thereafter, signs of blister have been observed in 41.3% of the cases of being stung as well. According to the observations of the study, there comes a constant feeling of scratch lasting between 5 and 30 minutes after being stung. In this study, the average of the length of constant and continuous feeling of scratch in the place was determined 13.1 (±9.4) minutes, but the alternate feeling of scratch lasted up to between 24 and 48 hours and sometimes to a week later but has lost its intensity gradually.

In this study, there was no significant correlation and relation between the intensity of the main symptoms

of being stung such as feeling of scratch and pain with the numbers of being stung (Gamma Correlation Coefficient=0.001; $p>0.05$). In other words, the increase in the numbers of being stung did not affect the intensity of the emergence of its symptoms.

According to the experiences and expressions of the people under investigation, to treat the place being stung and alleviate its pain, antiseptic alcohol, washing with cold water and soap, and also sucking and sprinkling the place with the saliva and spraying of salt are used which in some cases had good effect on soothing the pain.

In this study, 80.8% of ant stings occur in indoor places and 15.6% in outdoor places and in the precincts. 72.8% (162 individual) of the people under investigation were stung during taking rests, sleep, praying or studying, or other activities on the ground in indoor places (resting place, prayer room, etc.) and only 8% were stung by sting ant during taking rest or sleep on the bed (Table 4). Statistical comparison shows that the cases of being stung by ants on the ground in indoor places is significantly more than those in which the person was lying and resting on the bed ($p<0.05$).

It was observed in this study that the human's moving members are exposed to being stung by ants more than other parts of the body and among these the foot and shins (with the frequency of 50.7%) have significantly been suffered from being stung more than hand and forearm (with the frequency of 32.7%) and other parts of the body. (Degree of freedom=2; Chi Square=27; $p<0.001$; Table 5).

Table 4- Distribution of ant stings in different scenario and place in the Abu-Musa, Greater and Lesser Tunb islands during 2009-2010 (Chi Square=189.2, Degree of freedom=2, $p<0.001$)

Ant stings places	frequency	Percent
On the ground (indoor places)	162	72.8%
On the bed	18	8%
On guarding (outdoor places)	35	15.6%
Unknown	8	3.6%
Overall	223	100%

According to the reports from warfare medical caring units, the demand for controlling and fighting against the sting ants increases annually in the late spring and summer and in the early fall. Thus, the medical caring unit embarks on spraying pesticides on the floor, the interior walls of the resting place, and other indoor places, using the pesticides of organophosphorus, carbamate or pyrethroids. According to the reports from medical caring units, the effectiveness of this method is temporary and the ants reappear.

Table 5- Ant stings frequency in different parts of the body in the people under investigation in three islands of Abu-Musa, Greater and Lesser Tunb during 2009-2010

The body part or the place being stung	Absolute frequency	Relative frequency
Hand and forearm	73	32.7%
Foot and shin	113	50.7%
Belly, back and side	28	12.6%
Head, face and neck	9	4%
Overall	223	100%

In total, during the study, 651 samples of the sting ants were collected from indoor places and their precincts in the mentioned islands. All samples were from the type of *Pachycondyla sennaarensis* (Mayr 1862) (Figures 1 and 2). The identified ants were compared in systematic characters with those of the previous researches which were confirmed by Professor Bolton in Natural History Museum in London, and then were confirmed.

These samples were quite similar to the ones which were captured in the previous study from other southern regions in Iran, in terms of morphology and systematic characters.

Morphological features: Worker ants (sterile females) are around 4 to 5 mm long, but the reproductive females are slightly bigger and are between 5 to 6 mm. These ants have eyes. Their mandibles are triangle-shaped and have 6 main teeth and 2 subordinate teeth. These 2 subordinate teeth are located as secondary and shorter ones next to the fourth and fifth teeth (Figure 1).



Figure 1- Mandibles in the sting ants, *P. sennaarensis* and subordinate teeth are showed (1000X)

In the lower part of the mandibles, there is a distinct round hole known as mandibular fovea. Frontal lobes are present and with head from the front (face), they cover and conceal the exit place of the first joint of the antenna. Tibia in hind leg has a large pectinate posterior spur and a smaller simple anterior spur. Petiole has only one segment (Figure 2).



Figure 2- Sting ant, *P. sennaarensis* (600X) ant in Iranian islands (Abu-Musa, Greater and Lesser Tunb)
a: petiole, b:small anterior spur, c: large pectinate posterior spur, d: sting

Discussion

All the predated sting ants in this study in the three islands of Abu-Musa, Greater and Lesser Tunb were recognized as belonging to the type *P. sennaarensis* (Mayr, 1862), which is counted as the first report from these three islands. The existence of this type has been reported previously in some southern parts of Iran [10, 11, 12, 13, 14 and 15]. It is necessary to mention that in the previous studies done on the fauna of medically important Arthropods in the three islands in 2002, there was some mentioning of the existence of some sting ants in these islands without citing the type [18].

P. sennaarensis is the native African species in Savannah and forest, which first was recognized and reported in Sennar region in Sudan by Mayr [19]. This sting ant is widespread in most African countries and also in the Arabian countries on the Persian Gulf area [8, 9, 20]. This species is known as Samsun ants and is not a member of Fire ants which normally are said to sting ants of *Solenopsis* genus [4].

The populations of the predated *P. sennaarensis* from the three islands are morphologically quite similar to those of the same type predated in other parts of Iran, but differ from the existing populations in other parts of the world, in terms of the number of teeth in the mandibles (have two attached small teeth in the fourth and fifth teeth) and also in terms of the shape of shin or Petiole (the segment joining thorax to the abdomen) [4, 13, 14]. But according to the experts' viewpoints and their confirmation, the type of *P. sennaarensis* existing in Iran is not considered a new species, despite the morphological differences with other population existing in the world (personal correspondences with Professor Bolton).

In this study, the prevalence of being stung in the islands was around 70% and more than 27% of those being stung had been stung more than 5 times annually. On the other hand, more than 85% of the people had previously observed these ants and more

than 77% were capable to identify them, indicating the prevalence and spread of these ants in the islands and in the human ecology and the increase in the people's encounter with these ants. In the study done in the regions of Sarbaz and Iranshahr located in the south of Sistan Baluchistan, more than 95% of people under investigation were able to identify these ants and the prevalence of being stung in the mentioned regions was 95.2% [13, 14]. The significant difference of the prevalence of being stung between the south of Sistan Baluchistan and those of the present study can be ascribed to epidemiological indexes as well as, probably, the temporary and rather short-term presence of military personnel and in particular, soldiers in the regions under investigation. Since, many of those investigated had entered the islands a few months earlier. However, many indexes can have their effects including the spread of ants, and the people's habits and manners, particularly while resting. For example, in another study done in Qeshm, the prevalence of being stung was 63% [15]. Investigations done in the Saudi Arabia showed that the dangers from sting ants to human beings derive from a set of factors such as the extent of their contact and colonies in human environments, the numbers being stung and the extent allergy-making in their venoms [21].

The present study has shown that *P. sennaarensis* is in close contact with the human beings in the islands and has adapted itself well with the geographical conditions in these islands. This is similar to the behavior of this species has been observed in Saudi Arabia [22].

Although 80% of the people were stung more than once, none of whom were leading to sever allergic symptoms or anaphylactic shock. In Iran, as yet there has been no record of anaphylactic shock stemming from the sting ants [14, 23].

In the investigations done in the UAE, there have been reports of at least 30 cases of allergic reactions

following sting of *P. sennaarensis* and 2 cases led to death due to anaphylactic shock [24]. In Saudi Arabia, the sting of *P. sennaarensis* is considered as one of factors threatening the public health and there have been reports of anaphylactic shock [25, 26].

The mechanism of the reactions stemming from the sting of *P. sennaarensis* is of hypersensitive nature with the mediation of IgE1 (Type 1 IgE1 mediated hypersensitivity) and its identification is possible by private skin test, recognizing IgE [7].

Biochemical researches done on the venom components of *P. sennaarensis* in Iran have shown that their poison lacks protein [23]. Researches have shown that the emergence of shock in people who are being stung by the ants relates to the protein existing in poison [27, 28]. However, the venom components in different population of *P. sennaarensis* are different. The different populations of this species have different venom components, depending on geographical conditions, which can affect the venom's effects [29].

Recorded signs and symptoms stemmed from the stings of *P. sennaarensis* in these three islands are quite similar to the reported symptoms of being stung in the south regions of Iran. Thus, it seems that the sting ants existing in these regions have similar origins. A few people from the UAE live in Abu-Musa Island and commute constantly to the UAE. They mostly bring their required equipment and necessities from that country by the ships. As such, it is possible that they bring samples of the sting ant population of *P. sennaarensis* existing in the UAE to the island, along with their equipment, which appear to be more dangerous than Iranian sting ants. Therefore, there is the possibility of transferring and replacing the population of these ants from the UAE. So, this issue should be paid attention and monitored. Because, it has been proven that many ants in the world are transferred and spread through human, due to business and transporting goods, equipment, plants, fruits, agricultural and food products [3, 5]. Therefore, despite the fact that the stings ant existing in both countries are the same species, there is the possibility that they differ in terms of venom components which leads to the UAE ones being more dangerous. As such, it is suggested that an investigation be done on population of the sting ant existing in the region of Abu-Musa Island in which the UAE Arabians are living and that they be monitored constantly so as to prevent the (establishment and) replacement of the probably more dangerous populations of this species in the island. Biochemical studies of the ant's venoms can help the completion of the required information to

monitor these ants in the island.

With respect to the fact that around 72% of people under investigation were being stung while sleeping or taking rest or lying on the ground and only 8% of the cases of being stung have occurred when taking rest on the bed, it is possible that the sting ant are unable or unwilling to climb the bed's framework (or rods). Thus, it is possible to decrease the cases of ant stings by changing life style and people's form of taking rest and by persuading them to use beds when taking rest or even sitting. Therefore, the use of bed to take rest can probably be effective in decreasing cases of being stung. In overall, according to the previous researches, the observance of self-protection principles and the prevention from facing insects can be effective in decreasing the cases of being stung by insects and other arthropods [30 and 31].

More than 80% of the people being stung were stung by these ants in indoor places and around 57% were stung while sleeping, indicating the much confliction between the human's living place and those of ants. Therefore, it seems that the ecological studies of the ant's colonies and nests in these islands are necessary so as to come up with any kind of proposal and the implementation of schemes concerning controlling the sting ants in these islands.

According to the results, the ant stings prevalence is rather high and so, the spray of pesticides in indoor places as is done by medical caring units seems not to have much effect on decreasing the cases of ant stings. Despite the fact that the sting ants existing in these islands caused no casualties among soldiers, they are considered as threats for the health of military people residing in the islands, but there is no practical plan to effectively control them [32]. Investigation and research on this respect and the implementing an effective control program on sting ants in these islands can also be the aim of passive defense.

Conclusion

Successful control of these ants in the islands requires further biological and ecological studies concerning the population of sting ants and their nests in these regions. Finding places in which these ants build nests and form colonies in these islands, seasonal activity and its climax and obtaining more ecological information about this ant can be very effective in defining a scheme to control them which is considered as a health problem in the islands under investigation. Although signs and symptoms derived from being stung in the islands are not dangerous and do not lead to shock and death, they cause soldiers existing in the

islands to suffer from pain, a feeling of scratch, and severe itching and from the removal of calmness, particularly during sleep. Therefore, preventive actions and the control of these ants, by devoting more study on their colonies, should be of prime importance.

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