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Evaluating factors influencing insect outbreak case study (Invasion of locusts)

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ABSTRACT

Insects are one of the most important creatures in the Ecodistems, including the variety of locusts, due to their specific physiology, the coexistence and impact on the human food basket, high reproduction potential, and the direct impact of climate parameters on research, based on Interviews with experts in the field of agricultural Jihad and plant physicians have been selected as a factor analysis method. The purpose of the research is to represent the profound environmental effects on the life cycle of locusts. Biological and environmental parameters, respectively, with 19/32% of the variances, were at the forefront of the factors, because any unwanted changes in it directly affect all components of the life of the insect.Then the environmental factor which explains 17/67% of the variances and the third factor of the biological change, was the third with 16/21% of the variances. Agro-pastralism (invasion of locusts into rangeland and agricultural land) was ranked last with 15/07% percent of variances. The effect of all four factors on the flooding of locusts is nearly interrelated and with minor differences, so that the outstanding footprint of climate and environmental changes and then the reflection of locusts can be seen in the some way.

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1. Introduction

In the geography of the planet, Insecta is a member of the Arthropoda branch and includes two and three species known to it. It is one of the oldest and most dispersed species, which are found almost on the whole surface of the biosphere from the bottom of the sea to the summit In high, even in snow-covered areas, the Arctic, in the desert and in the burning desert, in lush green fields covered with fields, gardens, pastures and in every environmental situation, and in the climatic and geographic conditions of the globular surface, activity (Shojaei, 2010). Insects roughly 400 million years before drought, until the Carbonifer period, 100 million years later, was roughly diversified, and since then, drought and freshwater habitats have flooded across the globe. They survived the extinction of the Paleozoic Empire (the Perminian era), which was larger than a full-fledged nuclear war.

The adaptation of insects over a lifetime of about 400 million years is due to the geographic and climatic changes of the planet in the quadruple period, which has been caused by severe earthquakes, mountains displacement, water advances and vice versa other geographical changes. In turn, it is a decisive factor in the survival of insects against the adverse effects of these changes (Shojaei, 2014). Regarding the importance of insects, the very thing that a product that humans harvest is the remnant that remains of insects for him. In agriculture, insect damages and threats, especially through activities that these animals have been planting on crops since planting to harvesting and storing products on the cabin, is economically significant. The insects, on average, 30% by feeding on members of their host plants, such as leaves, flowers, fruits, branches, trunks, roots, as well as sucking sap herbs, leads to total destruction or relative loss of agricultural crops.

They also cause severe epidemics in fields, gardens, forests and rangelands through the transmission and spread of various viral, bacterial, fungal, and other diseases. In the meantime, locusts are driven by high reproductive power in an environment suitable for growth that is completely dependent on environmental and climatic parameters, due to irreparable damage to farms and agricultural fields, and close coexistence with humans, especially in The association with the harvest of fodder and cereals has been selected for research (Shojaei, 2005).

1.1. Locust biology

The life cycle of the desert locust, *Schistocerca gregaria* (Forskål), consists of three stages. These are the egg stage, the hopper (larval or nymph) stage, and the adult stage. The longevity of desert locust ranged between 34 and 90 days depending on temperature, and the average duration was 40 to 50 days (Bennett, 1976). The exact conditions that cause maturation of locusts are not known, but rainfall appears to play an important role (Norris, 1964). The time required for the adult locust to be sexually mature, vary greatly depending on climatic and nutritional factors and under harsh conditions it can last as long as 40 weeks (Uvarov, 1977). When conditions are suitable, adults mature in about 3-8 weeks (Pedgley, 1981). Mature adults copulate for 3-14 hr and the female lays eggs (Ashall and Ellis, 1962), in bare and moist soil, 5-10 cm below the surface (Uvarov, 1977). A single copulation is sufficient to fertilize a number of successiveegg-pods, in *Schistocerca* (Norrris, 1954). In the field a female lays an average of 3 egg pods at intervals of one week, minimum 3 days and maximum 14 days (Ripper and George, 1965). In the laboratory 9-25 egg pods for a single female were recorded (Hussein and Ahmed, 1936; Hunter-Jones, 1958). Gregarious females lay 2-3 pods and each pod may consist of from 60-80 eggs. Solitarious females mostly lay 3-4 times, each pod containing 100-160 eggs. Egg pods are laid at intervals of 7-10 days (Copr, 1982). Providing there is adequate soil moisture, the rate of egg development is dependent upon soil temperature. Below about 15 oC there is no development; from 15 to 35 oC the period for development decreases, from about 70 days at 19 oC to 10-12 days at 32-35 oC; above 35 oC it no longer decreases and high mortality occurs (COPR,1982). in cubation period of *Schistocerca* eggs ranged from 26 days at 24°c to12 days at 33°C and above (Wardhaugh et al., 1969). Incubation period varies from 9 to 25 days in the summer and monsoon breeding areas, 10 to 22 days during long and short rain breeding areas of East Africa, and about 10-29 days in the coastal areas around the Red Sea and the Gulf of Aden (Venkatesh and Singh 1972; Roffey, 1982; Steedman, 1990). Solitary hoppers undergo six moults whereas gregarious ones moult five times. The last moult (fledgling) gives rise to immature adults. Depending on temperature, the total duration of the hopper development period may vary from 24-57 days, with an average of about 36 days (Wardhaugh et al., 1969).

1.2. Locust ecology

The breeding ecology of solitarious and transient populations is essentially the same as that of swarming ones (Uvarov, 1977), with great emphasis on habitats with ephemeral vegetation, either natural or man made. Although locusts require certain ecological conditions for breeding, rainfall is considered as the main ecological factor responsible for its general pattern and seasonal occurrence. (Rao, 1960; Magor, 1962). Sikka and Singh (1987) showed that although sufficient opportunities can prevail for the desert locust to live, these do not seem to be good chances for the desert locust to successively breed in plague proportions unless there are adequate and spaced rains. Chandara (1988- 19930. concluded that heavy rainfall (50 mm) for at least 2 consecutive months is necessary for successful breeding of *S. gregaria* in Rajasthan during the pre-monsoon period. Erratic distribution of rainfall, both in time and space, results in great variations in the soil moisture and this affects the rate of growth and pattern of the ephemeral vegetation (Hemming and Symmons, 1969). and on this depends the survival and the degree of gregarisation of scattered locust (Uvarov, 1977). Sandy plains or silty soil bear diffuse short perennial tussock grasses and ephemeral vegetation preferred by locusts for egg laying (Popov, 1965). Also oviposition sites are largely confined to the moist and sandy cultivated wadies (Popov, 1958; Stower, et al., 1958). During recession periods, when individuals are subject to low densities, (Phase solitaria) they inhabit a broad belt of arid and semi-arid environment, which covers over 16 million km2. Gregarious desert locust can migrate up to 3000 or 4000 km (Rainy, 1963; Pedgle, 1981). These migrations are more or less down wind, although a swarm migrating this way generally has speed slower than the mean speed of the wind (Johnson, 1969). Even solitary locusts show local migration, and it is suggested that they travel distances of up to 1000 km. This distance is normally covered when locusts follow their seasonal migration trends with the prevailing winds (Rao, 1942, 1966).

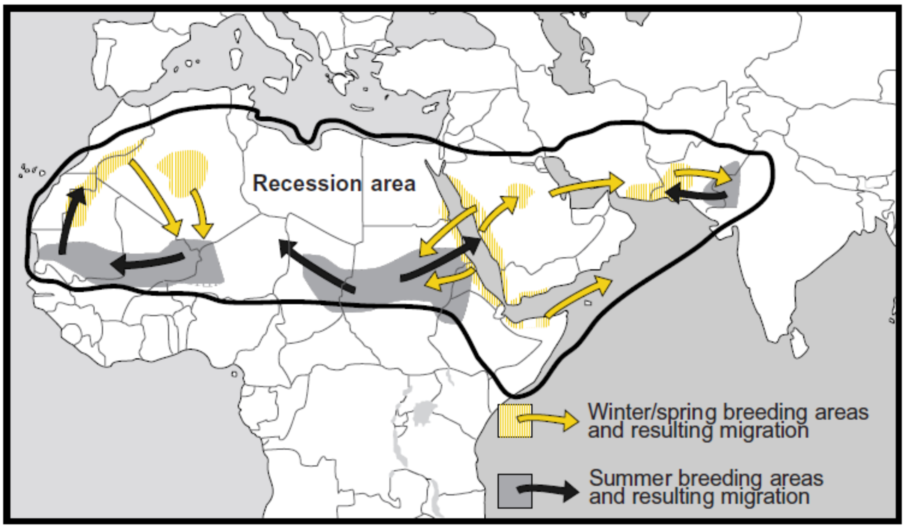

Fig. 1. The geography of locusts infest through climate, especially heat and wind, These bring them into particulary zones during the summer (the Sahel and the Indo – Pakistan desert) and during the winter/spring (northwest Africa, along the Red Sea, Iran, Baluchistan).(Symmon & Crossman, 2001).

2. Material and Methods

Regarding the studied components, the governing approach in this research is quantitative and analytical. The statistical population of the study consisted of experts in agriculture Jihad, plant physicians, and specialists in the provinces of (Golestan province, Khuzestan, Kohkilouyeh and Boyer Ahmad) (30) people. In the small part of the model, the factor analysis model was used to summarize the information in a sequence in which the summarized results are meaningful in meaning. If in the factor analysis the goal of summing up the index number is to be significant factors, then the factor analysis R type, which is used in this research, which is based on this analysis of the amount Specifically, the amount of variance explained by each agent is a factor, which is the linear combination of the principal variables, which itself represents the summed aspects of the observed variables and the factor load, which expresses the correlation between the main variables and the factors. And also the rotation of the factor that is used to adjust the factor in order to achieve meaningful factors and factor weight has been used in determining factor scores. Extracting factors using a correlation matrix is determined using factor matrix, common factors and relative importance of each indicator. Special vectors, which are in fact the amount of loading corresponding to each index for the relevant factor, which is defined as factor load, is used in the factor analysis in connecting the indices together in the factors, whose coefficient of correlation is above0/5. Be Extracting the factors of the indexes loaded through varimax rotation in the factor analysis. The result of this research is the reduction of the indicators to 4 factors, which totally covers 68/227% of the variance, which indicates the desirability of the factor analysis and indicators used.

3. Results and discussion

The characteristics of the interviewees and interviewed experts are based on (1) 58% of respondents are women and 42% of men. The highest frequency was in the 20-30 age group, accounting for 49%a. 62% percent of those with a master's degree and 37 percent had a Ph.D.

Table 1. The characteristics of the interviewees

Sex	Abundance	Percentage
Man	A133	A57.8
Female	A89	A42.2
Age	**Abundance**	**Percentage**
A20-30	A108	A48.9
A31-40	A73	A34.1
Over 40 years old	A37	A17.2
Education	**Abundance**	**Percentage**
Masters	A138	A62
P.H.D	A81	A37

(Findings of Research 2018)

The result of Bartlett's test (2) showed that the significance of the test was less than 0.05. Also, the KMO index is 87% And due to the fact that it is close to number one, the number of respondents is suitable for factor analysis. Regarding the correlation of each of the indices, the outbreak of locusts was extracted in four factors. The factors are named according to the nature of the variables.

Table 2. (Bartlett and KMO test results)

Kmo Indicator Examples	A0.0.81
Amount of Cayenne Bartlett	A0.372.628
Significance level of Bartlett test	A0.0.00

Findings of Research 2018)

Table 3. extracted factors with special value, percentage of variance and cumulative variance percentage

Factor number	special amount	Special variance percentage	Cumulative variance percentage
A1	A7.162	A19.312	A19.312
A2	A6.123	A17.673	A36.944
A3	A5.644	A16.211	A53.155
A4	A4.609	A15.072	A68.227

Findings of Research (2018)

In order to determine the effective factors in the outbreak of locusts based on the study method and the results of the interviews with their experts, they were categorized into four factors and named according to the nature of the variables under the headings of the set of environmental- biological, biological, environmental and agro-pasteural factors.

Table 4. The set of environmental and biological factors in the locusts outbreak

Agent name	Variable	Load factor
Changes in the set of environmental factors – biological	[1] Diapause egg seeds due to environmental stress	A0.97
	The secretion of Adipokinectic Hormone due to environmental stress and increased carbohydrate intake by attacker locusts)	A0.94
	The optimum temperature of 32-38° C for locust beans and their metabolic defense by increasing patchy attack	A0.91
	Morphological changes (due to increased hormones), along with changes in habits and behavior due to changes in climatic and vegetation conditions, and eventually outbreak of locusts	A0.88

Findings of Research (2018)

1-The phenomenon of Diapause in the form of sleep and stopping growth, loss of metabolism, usually associated with a decrease in water and an increase in body fat, especially in locusts. During the winter, the resistance of the insect against frost and cold significantly When the ambient temperature increases in the spring and the cut off Diapause, the resistance of the insects to the cold and the freezing of the spring decreases. Although the severity of cold and spring frost is usually less than cold and spring frost, insects suffer great losses in these conditions.

The first factor was named "Changes in the set of environmental and biological factors", the specific factor of this factor of 7/163 which includes 19.32% of the variances with 4 variables, has the most effect among the four effective factors Owned. Biological studies, population genetics and biochemistry have proven that mutation changes in the genetic material are essential for the occurrence of characteristics in local populations of living creatures. In other words, environmental stress, as it changes the character of the plants, also affects the general traits of locusts by altering the DNA sequence (Yazdi, 1989; Farrow and Colless, 1980; Rokas, Ladoukakis and Zouros, 2003). Many insects in high densities reduce their reproductive levels or increase the effect of natural pathogens and enemies (Knell, 1998). Locusts can also be affected by adverse environmental conditions for living in different geographical contexts. Find out. In such a way that the geographical conditions create local characteristics and traits for the locusts population of each region (Fatemi, 1992; Otto and Michalakis, 1998; Roff 2002). Feeding of stressed forage can also produce a grasshopper flood stage The occurrence of dry and rainy season of some kind of organic acid (Absisic Acid) causes the leaves to enter the ligaments of the leaf and closes the photosynthesis process. Under these conditions, stressed grassy grasses stores different proteins and nutrients. Grasshoppers who feed on stressed grassy grasses damage their bodies more often than usual. (Jarvis, 1992; Watt, 1994). On the other hand, secretion of various hormones, such as Adipokinetic Hormone, in conditions of stress causes more carbohydrates to be consumed by locusts and increases the amount of fat stored in the body for the winged form. Fats play an important role in creating dark color due to secretion of the hormone secreted nerve cells The indicated hormone plays an important role in regulating metabolism in response to environmental changes. (Pener, Ayali and Golenser, 1997; Pener and Yerushalm, 1998). Normally, the natural selection of populations resistant to pathogen attack is resistant to neutralization Pathogenic factors require a higher metabolic rate. Individual locusts prefer a lower temperature for a temperature of 38-44 ° C for lower temperatures. The efforts of locusts to rest in the sun and increase body heat without active metabolism and providing antifungal agent or alienation cannot be achieved. The migratory locusts choose to heat the temperatures of 32-38 degrees. Heat is lower in heights higher in rainfall and higher in forage, allowing migratory locusts to provide protective materials against pathogens from host plants. These locusts increase their metabolic defense of the body against a pathogenic attack when they begin to migrate and gain physical heat (although they are more exposed) Therefore, in insects, any type of individual activity and geographical distribution are affected by the control of the temperature range at the upper and lower thresholds. Each of these ranges is proportional to the growth stages (eggs or larvae of the puree or pupae in the complete insect) and the season of activity Local characteristics and changes in other regional elevation factors, especially humidity, heat and light.

Table 5. The role of environmental changes in the outbroke of locusts

Agent name	Variable	Load factor
environmental changes	The song reduces the ambient temperature and the insect response to it	A0.83
	Frequency of freezing and melting conditions	
	Moisture and drought effects	A0.81
		A0.77
	Rainfall effects	A0.74
	Hard clayey soil without vegetation and extensive layers of grasshoppers and individual insect transformation to insect phases	A0.71
	Locating grass seeds in hard soils, sandy soils, wetlands, hillsides in the shade and under the rocks	A0.68
		··0000
	Wind impact	A0.66
	Light or photoperiodism cycle	

The second factor is "Environmental change" with a special value of 6/132% which accounts for 17/632% of variances with8 variables. Undoubtedly, insects, like other parts of an ecosystem, are affected by climate change (Fuhrer, 2003). The change in environmental conditions will affect both the population and the activity of insects as well as beneficial insects, and these effects, either directly or indirectly, It directly plays a role through changes in the chemical and physiological composition of the host plant or through the effects on predators, competitors and pathogens of insects. (Patterson, 1995). Distribution of insects in a farming system can be affected by climate change (McDonald et al., 2009). Studies show that pressures from climate change are likely to result in a demographic explosion, leading to the spread of pests, the emergence of new species, the loss of biodiversity, and the increase in human and animal diseases. The global warming could lead to Variant changes in the vector, the exacerbation of the human-associated risk factor and the increase of diseases transmitted from soil, air and other diseases directly linked to the social and economic consequences of changing human behavior. The global warming can lead to the spread of disease Infectious diseases such as cholera, malaria and yellow fever (Stone, 1995). Larvae, some insects may be affected by extreme temperatures, drought, UV, ice and melting, and all possible consequences of climate change at high latitudes. Climate change disorder is also expected to affect the quality and quantity of habitat, nutrition, behavior, immune function, and the pattern of geographical distribution and the frequency of definitive hosts (Shosta and Samuel, 1984). Climate in particular, on ambient temperature It directly affects the growth of the mosquitoes, the gonotrophic cycle, the life span and the growth period of the species of Plasmodium, and even affects other environmental factors such as growth and reproduction (Atehmengo et al., 2014). Life in the soil for locust beans, it is unique to growth, egg or pupal so that the conditions of soil moisture, such as heat and moisture, An important step in this process is the social insects, such as ants and termites, live their winter life at the bottom of the bushes in a state of inactivity, so-called hibernation, and at a very little depth (Daily and Doyen, 1978). Nutrition The actual losses of most insects in gardens and farms in the early spring and at the same time as the temperature increases in different regions and the season of cold and frost begins: the minimum heat necessary to start the spring activity in these insects varies depending on their species, for example Most locusts (Melanoplus) are 10° C. (Price, 1975). The rapid reduction of heat over its gradual decrease causes insect mortality at the egg stage. Mild winters are worse off than cold winters for insects and a negative factor in predicting their population growth. Drought and reduced moisture in the activity of insects cause growth in larvae, and as soon as the moisture and moisture content of the larvae increases, the larvae of the larvae reestablish their growth and become pupae (Metcalf and Luckmann, 1998). The relative humidity of the environment is essential for the activity of some insects, especially spawning in October and November, moisture also affects the diet of larvae and insects. In general, the growth rate of the embryo, especially in the species that spawns under the soil or inside the tissue tissues, is the direct effect of the moisture conditions of the environment, as is the growth of the larval stage. The effect of rainfall through mechanical damage caused by insect washing in different stages of egg, larvae, pupae and fullness of plants from the airways and direct effect of rainfall is due to changes in relative humidity and ambient temperature. The effect of wind is to change the direction of flight or the movement of insects and transfer to other favorable or unfavorable environments. The conditions of light and ambient light, especially in terms of time, are called photoperiodism and the variation in its intensity in biological activities and local distribution of insects, which have a direct effect on the amount of photocatalytic activity, the effect of photoerpiodism has been correlated with the diapause process (Atehmengo et al., 2014) Climate factors and geographic distribution powers geographical of various species of insects are heavily influenced and controlled. For example, sea turtles (Schistocerca gregaria). It is not a native of Iran and comes from Saudi Arabia or India, it is completely dependent on the situation in the southern regions of our country during the time of the attack, in such a way that atmospheric conditions, such as temperature, relative humidity and light intensity, etc. It is not the same and varies greatly, this is due to the difference in the rate of growth in insect larvae, and thus causes the difference in the date of their insects to disappear from a few days to a few weeks. (Patterson, 1995). There is no doubt that the climate Earth is changing and new evidence of it is seen every day. There is more evidence to better understand climate change. Including the increase in the global average of air and ocean temperatures, the spread of melting snow and the increase in global mean sea levels. (Atehmengo et al., 2014). In general, the climate instability in a region of a region is influenced by two groups of actors. The first group is the factors that cause annual climate change, including El Nino, Lanina, Nao, and the second, factors that shape long-term change trends. Long-term variations are also affected by the main two main factors, the energy coming from the sun and global warming due to resettlement of the flora (Kocheki et al., 2007. With this trend, climate change in the future will increase, evaporate, dryness and water deficit (Segal, 1994). These changes have caused a disturbance in the balance, with effects such as hydrological changes, increased stresses on wildlife, flooding, landslides, avalanches, increased soil erosion, increased runoff and reduced feeding of aquifers Underground, reducing groundwater nutrition, decreasing the quantity and quality of resources, increasing damage and pressure on species and ecosystems (Root, et al., 2003) Accordingly, environmental parameters and, consequently, even modest changes that occur following climate change may seem to affect the life cycle and natural growth, and ultimately the outbreak of locusts.

Table 6. Biological changes in the flooding of locusts

Agent name	Variable	Load factor
Bio variation	The secretion of the nerve hormone and its effect on the heart and esophagus of locusts	A0.64
	Occurrence of Reproductive Diopes and Late Deepose	A0.61
	Occurrence of sequential changes in insect genome sequence following environmental stress	A0.60

The third factor, entitled "Biological Changes", with a specific amount of 5/64%, which explains 16/211%of variances with 3 variables. Up to now, there are about 13 species of migratory locusts in the world that can be exploded so that some of the locusts of the migratory species from an individual state to a rebellious state will need to consider the principles of natural selection and evolution. Stratigraphic lifetime of locusts is such that, under favorable ecological conditions, wintering of temperate temperate soils in the Poaceae family feeds them with a high population density. In such a situation, locusts from the individual stage gradually change the phenotypic character of the migratory phase (Descamps, 1961). Understanding the changes in the locust environment, such as food shortages, heat and humidity changes, day length, etc., by the nervous system The secretion of neuronal hormones occurs. The result of these reactions is the changes in the rate of reproduction of locusts (Davachi, 1954; Pener, Pener, Ayali and Golenser, 1991). Neuro secretary cells. Hormones and secreted substances are responsible for increasing the population density of locusts and the body's contact with the blood. The population of the hormone secretion increases in the corpora Cardiaca, in contrast to non-stimulatory contact stresses, activates the corpus luteum (Corpora Alata), and juvenile hormone reduces the body's metabolism in low density Which features the individual stage in the insect, so the germs on the heart and esophagus are part of the metabolic regulator of grasshopper growth in environmental conditions (Pener, 1991; Green Field and Pener, 1991). Relation to spawning at times of diapause Locusts, after migrating to new biological areas and during sexual maturation, whenever they face environmental stress, discarded eggs on the ground, while environmental conditions are favorable. Three Asian locusts Generates an active generation. An Asian grasshopper breed in an environmentally friendly environment of 45-60 days. If the third generation is exposed to cold winter conditions, it will take a generation between 6 - 8 months to complete. (Drake and Gatehouse, 1995; Mitter and Schneider, 1987; Farrow, 1990, Stenseth, 1987). Asian locusts are found in parts of Africa, Asia and Australia individually. The distribution and migration of this locust is not like a sea locust, and often has regional migrations. Asian grasshopper is a diabetic breed, male, and diabetic during the egg period. Having a diapause is a kind of cyclic strategy, that is used by locusts to adapt to the climatic conditions of the area.diapause has a different period for eggs for the Moroccan and Asian grassland, and the lack of need for long term flights between the two grasshoppers compared to the marine grasshopper. Except for a number of locusts such as the Grasshopper, which produces three generations per year during the outbreak. Most lmmigrant and native settlers produce only one generation per year. These locusts make a significant part of their life cycle in the form of diapause eggs (Farrow and Colless, 1980). On the other hand, heat transfer and transfer into soil are changing as a result of climatic changes in the life cycle of insects. So that the occurrence of leakage changes in genetics due to environmental stresses leads to changes in the sequence of the DNA genome and general traits in the progeny of locusts (Rokas et al, 2003).

Table 7. The role of Agropastralism agent in the outbreak of locusts

Agent name	Variable	Load factor
Agropastralism	Nutrition diversity in locusts (rangelands and agricultural lands)	A0.56
	Use of fresh fodder, especially in dry year	A0.55
	Poaceae family forage on consecutive rainy days in winter	A0.51
	Feeding stressed fodder	A0.49
	Reduce fodder	A0.48

The fourth factor was named "Agropastoralism[2]", with a special value of 4.609 which was explained by 15.072% of the variances and with 5 variables. Invasive insects into plants are divided into two groups of suckers and rodents. In the meantime, locusts, including destructive insects in the field of pasture plants and agricultural products, are considered to be rodent (Masabni and Lillard, 2000). Damage to livestock-based livestock systems based on pasture and loss of forage available to livestock. Outcome Locusts attack major exploitation concerns (Hewitt and Onsager, 1983; Joern and Gaines, 1990). Grasshopper is recognized as one of the most important pests affecting agriculture in all parts of the world (Weiland et al., 2002). The prevalence of locusts can cause extensive and severe damage to pastures, pastures, grains, vegetables, and crops (Slinkard, 1999; Lockwood et al., 2002). Grasshoppers cut six times the horns and leaves they consume. A grasshopper from birth up to 32 days old when it is puberty has the ability to cut 17 kg / ha of forage (Niknahad and Daneshi, 2013). Locust They compete with cows in rangelands and pastures. If locusts are modest, they can reduce the quantity and quality of forage production, which can reduce the ability of livestock farmers to use pastures. Locusts account for 50 percent of their body weight, while cows use 1.2 to 2.5 percent of their body weight for forage. They often use high quality plants to make the plants less damaged, which, if accompanied by a drought period, can have adverse effects on the plant community over a long period (Royer and Mulder, 2004). Locusts attack as massive masses in the path of vegetation. Therefore, after encroachment on empty vegetation areas, they change direction (Berryman, 19991) Some studies have shown that the dynamics of the locusts population is also related to the weather variable (Johnsona and Worobeca, 1988). And drought have a significant effect on the dynamics of locust populations, which is more than the effects of drought. Drought can be effective over a one-year period, but over a long period of perennial drought, the impact of drought is greatly affected. The living and non-living characteristics of the environment are caused by the drought, For example, a significant amount of available forage is lost and wooden parts that are unusable are increasing (Mattson and Haack, 1987; Jonasa et al., 2015). Concerning what plants and products are most affected by locusts, it is stated that all species Arable land and pasture are considered to be locusts, and locusts place all plants, especially fresh plants, with a higher palatability under the grass. The prevalence of locusts attacks can range from common pastures to adjacent private wheat, in which Vulnerability is far more likely to spread. (Onsager, 2000) Another reason for these problems is diversity in the taste of locusts. Locusts prefer habitats that host a wide variety of host plants, and their host plants can include grasses and forbes, as well as bushes with fresh leaves. As a result, locusts prefer wheat fields along with rangeland vegetation, marginal roads and

[2] The exploitation of agricultural pastures and lands under the attack of pests and insects.

dryland landslides. Asian locusts and Moroccans have migrated to a more restrictive level, and have a more limited outbreak than locusts. For example, locust beans in Morocco in the Golestan province's plains are damaging forage and cereals in Iran and Turkey as a result of their displacement. But in these areas, there is a shortage of rainy weather and favorable weather conditions. The variation and variation of locust populations in each region depends on the type and extent of the cultivation of grassy grasses. In order to provide human food, the surface of cultivated cereals and products such as wheat, barley, corn, rice, and so on every year increases. From the ten thousand years ago, when human crops started to grow on a more limited level and gradually expanded, locusts, individually and overturned, were able to provide populations for feeding on forage according to environmental conditions (Risch, 1987).

4. Conclusion

Insects are the most successful creatures throughout the kingdom of animals. They are remarkably adaptable, and they can live in any place. On earth, air, water, ponds and in any ecosystem, the activity of insects in the soil is often accompanied by a phenomenon of geotropism or a tendency toward the earth. The severity of this phenomenon is quantitatively and qualitatively influenced by the factors of food, moisture, heat and physical and chemical composition of the soil and, of course, the biological and physiological characteristics of the insect species. And also in the air and in the water, insects can be found in the burning desert and warm summers to the tip of the snowy mountains and ice lakes. Their small size indicates that they can adapt to very small places and do not require much food to survive. The effects of climate factors, especially heat and humidity, on the biological process and the activity of insects and other species, cause similar changes, and changes in the rate of growth, the intensity of metabolism and, as a result, prolong or shorten the life of the insect, alter the number of generations and modes Annual activity and fluctuations in species damage, as well as the effects of these in the population of natural enemies, make them more effective in the natural control of pest species, as well as the change in the regional changes of the population and the geographical distribution of insects in many generations. Insects and changes in habits and behavior of native species, decomposition of species into varieties and races It provides the emergence of new species. In this regard, in this research, based on the experts' opinion, four major factors, based on the factor analysis method, were used in the development and outbreak of insects, and in particular the case study of locusts, a set of environmental and biological parameters with 19.31% of the variances were topped by factors Which was obtained in the research process. The second factor was the environmental factor that explained 17.67% of variances. In the research process it was determined that this factor was the main factor in the outbreak of locusts and any unplanned changes directly affect all components of the life of the insect. The third factor of the change Biology, with 16.21% of the variances, was in third place. The important point about this factor is the influence of environmental parameters on biological processes affecting the physiology of insects, and in particular locusts, and the agropostal agent (according to the taste of diversity, Locusts are preferred wheat gardens along with vegetation cover on rangeland and marginal roads. To give.) With 15.07% of the variances, the ending was completed. The effect of all four factors on the flooding of locusts is almost interrelated and with minor differences, so that the prominent footprint of climate and environmental changes can be seen locally in the floodplain of locusts. And the last word, Climate change experts predict more extreme weather, including droughts, floods and cyclones. Whereas locust numbers decrease during droughts, locust outbreaks often follow floods and cyclones. Local increases in rainfall can favour breeding conditions for locusts and determine the size of feeding areas, leading to changes in plague development. Climate change experts also predict that temperatures will continue to rise. Temperature governs the speed of locust development and swarm movement. Thus, increased temperatures associated with climate change can potentially shorten both the long maturation and incubation periods during the spring and allow an extra generation of breeding to occur at any point in the Earth's ecosystems. The effects of climate change on winds are less certain. Any changes in wind speed, direction and circulation flows are expected to affect Desert Locust migration and could allow adults and swarms to reach new areas at different times of the year. Whether they will be able to become established, survive and breed in these new areas will depend on ecological, habitat and weather conditions. Insects are powerful and rapid adaptive organisms with high fecundity rate and short life cycle. Due to human interruption in agro-ecosystem and global climatic variations are disturbing the insect ecosystem. Erosion of natural habitats, urbanization, pollution and use of chemicals in agroecosystem manifold the intensity of environmental variations. Both a-biotic (temperature, humidity, light) and biotic (host, vegetative biodiversity, crowding and diets) stresses significantly influence the insects and their population dynamics.

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