International Journal of Ecology and Environmental Sciences
www.ecologyjournal.in
Online ISSN: 2664-7133, Print ISSN: 2664-7125
Received: 01-03-2021, Accepted: 02-04-2021, Published: 01-05-2021
Volume 3, Issue 2, 2021, Page No. 90-93

The affect of pest insects and diseases to natural seabuckthorn shrinkage in Zavkhan river basin, Mongolia

B Munkhtsetseg[1], A Uranchimeg[2], D Ganbat[3], D Jagdag[4]
[1] The Institute of Plant Protection, Laboratory of Entomology and Khan-Uul, Zaisan-Ulaanbaatar, Mongolia
[2] Laboratory of Plant Pathology, Khan-Uul district. Zaisan-17024,53/15. Ulaanbaatar, Mongolia
[3] Institute of Geography and Geo-ecology Mongolian Academy of Sciences. Division Forest Resources and Forest Protection Chingeltei, Baruun Selbe, Ulaanbaatar, Mongolia
[4] Ministry of Environment and Tourism, Mongolia Department of Forest Policy and Coordination, Chingeltei, Ulaanbaatar, Mongolia

Abstract
The wild seabuckthorn, hippophae which is counted in the subspecies of *H.rhamnoides L.ssp.mongolica Rousi* in Mongolia is popular in western part of the country in Bulgan, Khovd, Zavkhan, Tes, Bukhmurun and other small rivers in Selenge river basin. The initial research result stating the wild sea buckthorn was widespread in around 30000 hectare area in the country. Very recently it has been reassessed that the area of bushes of seabuckthorn covers around 14358.5 hectare in 2019. These studies show the wild sea buckthorn bushes have been decreased by more than 50 percent due to harsh weather conditions and misuse of human beings.
Early June study shows that 80 percent of seabuckthorn groves at research field was dying or getting old, 20 percent of the remaining live bushes was male and had only 20-30 percent of its spires survivable. The number of died and dried bushes in $10m^2$ ground was 83 in average. 60-70 percent of the dried and died bushes had its dried and blackened fruits remained. At the first ten days of September, bushes had defects mostly leaves becoming torn, growth of tree excrescence in 60 percent and 30-100 percent of leaves were torn of a bush at grove in Khar But. At the same time, the defects were less at Ulaan buraa, 20 percent of bunches were damaged and leaves of a bush were torn by 10-40 percent. The research fields were affected by a fruit fly, *Rhagoletis batava* (Hering 1958) of *Tephritidae* family. The sea buckthorn grove in Khar But had 30 percent of bushes dried that caused of plant diseases and 50 percent of its bushes were drying. When the died and dried branches were examined, they were diagnosed as affected *Aspergillus spp, Penicillium spp, Fusarium sporotrichioides* and gray mold. Also the rot in the main tube had fungus of *Fusarium spp.* group. These results demonstrate the drying of bushes are caused by the diseases moldered by the *Fusarium* wilt.
As there has not been any study on the diseases of wild seabuckthorn grown along Zavkhan river and no actions taken to control the diseases and insects. The shrinkage of bushes is expanding intensely caused by damages combined of fruit shrinkage, leaf torn, change of shape, main phylum rotting, damage by fruit fly worm and diseases like *Fusarium sporotrichiella.*

Keywords: *Rhagoletis batava* (Hering 1958), *Fusarium spp, Aspergillus spp., Hippophae rhamnoides, Seabuckthorn shrinkage*

Introduction
As the lowland of grand lakes in Mongolia has been affected by drought for many years and faced lack of water supply, the growth and spreading of wild seabuckthorn bushes and groves had dramatically decreased for last decades. Also the resource and growth of seabuckthorn has had shrinkage caused by the misuses of human beings, flood, fire, infectious disease and harmful insects that some parts require to be paid attention before being destroyed completely.
Scholars and researchers at the Ministry of Food and Agriculture, Plant and Agriculture Research Institute in Dakhan, Fruit and Berry Association did research in 2016 to define the wild seabuckthorn resources, locations, spreading and methods of protection and adequate usage comparing the database of 1991-2010 to 1961-1990 overseeing the weather forecast results from 6 points around the country. The air temperature has increased by 1.1 degree for the last 20 years than previous 30 years. The sum on active degree more than 10 ^{0}C was increased by 87 degrees in Selenge, 220 degrees in Bulgan, 292 degrees in Khovd for the last 20 years. However, the warmth did not benefit more growth of the wild seabuckthorn. The average annual precipitation was increased by 0,9-29,8 mm for the years. The average monthly air temperature and rainfall at Durviljin soum was not changed much in 1998-2018 compared to the previous decades that led no major effect of shrinkage of the wild seabuckthorn grown at the area. Still, the extreme heat and cold, strong wind had frequently affected the seabuckthorn in Khar Butnii Chatsargana to have shrinkage or accelerating the aging of bushes. In addition to that, they have been damaged seriously caused by the widespread harmful insects and infectious diseases and is now at risk of being destroyed completely.

Research Tools and Methods
The research was done with two stages. The first research was done at the Khar but grove at Zavkhan river in Durvuljin soum (47^0 40’ 56.4” 94^0 32’ 55.3” sea level: 1279m-1299m) and the second was done in Khar but (47^0 40’ 95.2” 94^0 32’ 90.9” sea level: 1284m) and Ulaan buraa grove of Zavkhan river (47^0 56’ 44.8” 94^0 06’ 42.9” sea level: 1218m). The sticker paper and grabbing nest were used to catch up insects to define and count the species and number of insects. The method to calculate the

density of spreading per 1м^2 was used to determine the insects living in ground and wintering. The sample of soil was sent to the soil laboratory of Agro-ecology school at the Agricultural University to examine the nutrient substances contents. The methods to examine the dead bark of tree to identify the diseases and measure the spreading were used to to research the plant diseases and the samples of affected by disease were analysed in plant laboratory at the Plant Protection Research Institute.

Research Results and Discussion

The wild seabuckthorn at the Zavkhan gol river basin grows in six areas in two soums; Borhiin gol-Chatsarganii tohoi, Khuren tolgoin garam, Khukh tolgoin bulan, Zuun bor hoshuu in Aldarkhaan soum and Mongol els-Kharganat, Khar buthnii eh, Ulaan buraad in Durvuljin soum at 1351.1-1539.7 meter above sea level. [7]. Seabuckthorn in Khar Butnii chatsargana is placed 30 km from Durviljin soum, Zavkhan province and covers 4790,65 hectare area. The grove length is about 25 m long and 1 km wide in average. It grows along the beaches at two sides of the river. It is divided into three parts named as Khar butnii eh, Ulaan buraa and Jirmiin shugui. [7]. The research team visited at Khar but located in Buural bagh and Ulaan buraa at Onts bagh. At Ulaan buraa, new grove of seabuckthorn has been developed at the new isles appeared in the middle part of Zavkhan River. It has grown where the river was shrinking and becoming narrow. It continues for about 15 km area (width is between 500 m and 1 km in average) for last 10 years. The soil humidity of the isles was as sufficient as in Khar but soil while the damage from the diseases and insects was same at both places. The soil content examination result shows Ph 8.2-8.3, less salt content (0.12-0.20%), poor pulp (0.48-0.77%), weak base for synthesis and lower nutrient elements, contents (9.7-9.1 %, mm) which impacts the growth of wild seabuckthorn negatively. Early June study shows that 80 percent of seabuckthorn grove at research field was dying or getting old, 20 percent of the remaining live bushes was male and had only 20-30 percent of its spires survivable. The number of died and dried bushes in 10m^2 ground was 83 in average. There were mostly bushes aged 10-20 years. 60-70 percent of the dried and died bushes had its dried and blackened fruits remained. When the research team held visit to see the situation of first ten days of September (on September 8) the defects that leaves becoming torn, growth of tree excrescences, fruit shrinkage, drying and blackening was common from the study result on the effect of insects on leaves and fruit. Defects that leaves becoming torn and growth of tree excrescence were spread in 60 percent of total bushes and 30-100 percent of leaves were torn per bush at Khar But grove. Though, it was less in Ulaan buraa. The damage covered 20 percent of bushes and leaves per bush were damaged by10-40 percent. The result of study on soil sample taken by digging method released that the seabuckthorn fly-larvae was kept in 0-10 cm depth. There were 8 worms per meter square area at Ulaan buraa while there were 36 in Khar But. The worms were kept in laboratory (in condition of 24^{o}C temperature, 60 percent humidity at normal light) 15.3% of them became mature fly after 8 days. As we observed the appearance of morphology, there were two kinds of fly; *Rhagoletis batava* (Hering 1958) of group (*Tephritidae* Newman, 1834), *Rhagoletis* Loew, 1862 and *Philophylla caesio* (Harris, 1780) of group *Philophylla* (Persson,1958).

As of now there are 4350 species which included in 480 groups of *Tephritidae* family and 850 species in Palearctic group in the geographical area [15]. The south east part of western Siberia has 98 species of *Tephritidae* included in 36 groups and 11 tribes. The current segregation database registered 62 species in 1862 groups of Rhagoletis Loew. *Rhagoletis batava* was innovated by Hering in 1958 first time. Later it was defined by Rohdendorf, 1961: Kandybina, 1977: White & Elson- Harris, 1992, Merz, 2001: Norrbom *et al*., 1999: Smit, 2010. The main plant for the fly is *Hippophae rhamnoides* (Elaeagnaceae). Its worm is fed by seabuckthorn fruit. The fly is noted that it is common in Netherlands, Switzerland, Spain, Russia (North Caucasia, Altai and Tuva), Kyrgyzstan [5] in one of the researches while another one noted it popular in Armenia, Belgium, Belarus, Finland, Estonia, Germany, Hungary, Italy, Latvia, Lithuania, Poland, European part of Russian federation, Kyrgyzstan, Sweden, Switzerland, Spain, Netherlands, Turkey, central and northern Caucasia and south Siberian mountains, Altai and Tuva.

The study on the species of Diptera group and their distribution was conducted well in Mongolia. There are 80 species of 1834 groups of *Tephritidae* Newman were registered in the country. Thus, the fly distribution in Mongolia was studied well in the country as we see from the academic articles by Kandybina M.N (1972), Richter B.A (1972) on the analysis of Mongolian and Russian expedition group findings of study in 1967-1995. However, the expedition group work has stopped for last 30 years due to the social and economic crisis and lack of trained national human resources. The study on harmful insects to fruit and berries was firstly published by L. Chogsomjav (1967) in his thesis 'Agricultural entomology and phytopathology'. Though it did not cover the issue of the fly. Also Dr. M.Davaa (1999)'s publication 'Studying and developing ways to control the main insects harmful to fruit farms' has mentioned 39 insects that includes only 3 fly species of 3 families specifying *Rhagoletis batava Hering* as one affecting seabuckthorn. He concluded the fly is common in Orkhon of Selenge, Baruunurt and Ulaangom of Uvs, Bulgan and Buyant of Khovd and Tes from Zavkhan provinces from his research held in 1971-1976.

M.N Kandybina (1972) researched the fruit fly in 1970-1971 and identified two new species *Rhagoletis mongolica*, *Phagocarpus permundus asiaticus* in the bushes of *Juniperus sabina* and *Nitraria L. harmag* in Umnogobi and Arkhangai provinces. Also the specie *Rhagoletis flavicincta* was noted it exists in the country by Enderlein in 1934 [5]. The seabuckthorn fly was noted at research papers from 1950's in Russia mentioning it was spread in east and west Siberia. The researches define the fly can live in the condition of sum of 10 ^{0}C degrees is around 252.1-319 ^{0}C, eggs develops at 339.5-390.3 ^{0}C, worms grow at 428.3-470.0 ^{0}C in average. One generation lives for 48-57 days. [22]. The research on the fly appearance and its affect in seabuckthorn farming was done by Ch. Chuluunjav (2014) in the country and defined the *Rhagoletis batava* is spread in western part of Mongolia, especially in Uvs area. One generation appears per year, its eggs were kept in soil in winter and it decreases harvest by 50-70%. Her study mentions its worm grows out from the third tenth of June and from the third ten days of August it is kept in soil. The result is similar to our research on wild seabuckthorn. Also the researcher noted the fruit fly is spread at certain points in Uvs, Khovd, Gobi-Altai, Zavkhan, Umnogobi, Gobisumber provinces based on oral information [13]. The research results by

Ts.Sainzaya (2014) on the fly appearance at the farm in Uvs province were moslty similar to Ch.Chuluunjav's research. Though, the period of active pairing and birth of eggs were different. This result might cause from the weather condition at that moment. Her research says the fly could fly at more than 18 ^{0}C and the peak period of appearance was at more than 22-23 ^{0}C. She also noticed the soil temperature will impact for the fly to come out of soil. As the fly comes out of fly from the second ten days of July to the end of August, it is effective to control the fly before its worm development from soil. The *Philophylla caesio* (Harris, 1780) was not studied before our research. It was noticed first time in the research. This specie affects *Urticaceae* family plant leaves, phylum and grows excrescence. Although we could not confirm exact result it makes path in leaves and causes the development of excrescence in seabuckthorn bushes, we found the excrescence appeared in leaves, the shapes were defected in 30 percent of research field. When we observed the branch with affected fruit three times comparing the healthy branch, 82.8 % of fruit in 25 cm branch was damaged, 77.2 % of leaves had excrescence appearance and leaves were torn by 100%. Majority of infectious diseases was mold (80%). Yet the study on the diseases in fruit and garden trees was not done before except some notes of existence in seabuckthorn farm in some soums of Tuv province in 2018. It was noticed the farm bushes were affected by *Verticillium wilt* by 1.0-8.1%, *Fusarium sporotrichiella* by 0.5-12.39%, M*onila altaica* by 3.8%, *Stigmina sp*. By 0.5-15.8% and *Sphaeropsis malorum* by 0.1% [2]. 30% of seabuckthorn bushes was dried and 50% of bushes we shrinking at Khar Butnii Eh caused by the disease. When we studied the transection of branches dried and shrinking, it was clear the main tube was badly damaged rotting. The study on May 17, found the remaining fruit not affected by Monila altaica was only 4%. The main branch of dried bush was damaged by Sphaeropsis malorum by 12%, remained in the branches and its fruit was shrinking and becoming black with mold. The bushes deteriorating by the disease was 30%. When we researched the samples of the branches, it was affected by *Aspergillus spp, Penicillium spp, Fusarium sporotrichioides* and grey mold. These molds are grown from pollution at any food. When the sample branches from the dried damaged bushes and main tube with rot was kept in favourable condition at laboratory, the black fungus was identified from phylum and *Fusarium spp*. kind fungus was found from the main tube rot. These are the cause of *Fusarium sporotrichiella* grown from the soil fungus which is shrinking the bushes.

Conclusion

1. The wild seabuckthorn grove along Zavkhan river at Durvuljin soum, Zavkhan province has faced both negative and positive changes that some of them are rotting while some grows in new places. There has been growing affect by harmful insects and diseases, soil degradation, decrease of level of river and water supply, aging of bushes, misuse of humans against wild seabuckthorn bushes. This deterioration leads to succession process gradual change over of population by *Salix caprea L*. bushes.
2. As there has not been any study on the diseases of wild seabuckthorn grown along Zavkhan river and no actions taken to control the diseases and insects. The shrinkage of bushes is expanding intensely caused by damages combined of fruit shrinkage, leaf torn, change of shape, main phylum rotting, damage by fruit fly worm and diseases like Fusarium sporotrichiella.
3. We have identified two species of fly; *Rhagoletis batava* (Hering 1958) of *Rhagoletis* Loew,1862 group, *Tephritidae* Newman, 1834 tribe, and *Philophylla caesio* (Harris, 1780) of *Philophylla* (Persson,1958) group which included in Diptera insect family.

Reference

1. Bayaraa G. Research report on wild seabuckthorn spreading and resources in Bukhmurun soum. Uvs province. PARI, 2007.
2. Gantuya M, Dejidmaa T, Dondov B. Some results of research on molds of seabuckthorn. Ecology & Plan Protection magazine. PPRI. №,2018:08:103-106.
3. Dorjderem B. Findings on research of spreading and styles of grounds of seabuckthorn of Tes River at Tes soum, Uvs province. Thesis for master degree on fruit and vegetable agronomy, 2009.
4. Kandybina MN. K.Izucheno плодовых мух (Diptera, Tephritidae) Монгольской Народной Республики. Энтомологические обозрение, LI,1972:4:909-918.
5. Korneyev VA, Mishustin RI, Korneyev SV. The Carpomyni Fruit flies (Diptera: Tephritidae) of Europe, Caucasus and Midle East: new records of pest, with improved keys. Vestnik zoologii,2017:51(6):453-470
6. Juuperelmaa U, Alymdaria TS *et al*. Summary of research on wild seabuckthorn spreading, genetics and resources of Mongolia. MoA Science magazine. Special issue for the 60th anniversary of Mongolian Fruit and Berries Sector Academic Conference, 2014.
7. Ichinkhorloo D, Otgonbileg Kh, Oyungerel D. The spreading and resources of Mongolian wild seabuckthorn, 2016.
8. Laagan B, Avdai Ch, Tsendeehuu Ts. The Seabuckthorn, 1976.
9. Определитель насекомых дального востока России. Том VI. Часть 3. Ред: П.А. Лер. Сост. В.А. Корнеев, О.Г. Овчинникова. Сем. Tephritidae- Пестрокрылки, 2004:456:479-482.
10. Oyun-Erdene A, Ulziituya A. MoA Science magazine. Special issue for the 60th anniversary of Mongolian Fruit and Berries Sector Academic Conference, 2014.
11. Tsendeehuu TS. Seabuckthorn and Nature Protection. Seabuckthorn as a King of fruit. Speech publication, 2012.
12. Seabuckthorn. Handbook MoFA MoLI. Coordination office for agricultural policy, 2010.
13. Chuluunjav Ch, Ganchimeg G. For the research on seabuckthorn fly of Mongolia (*Rhagoletis batava* Hering.) ARI magazine. MoA Science magazine. Special issues 25-30 for the occasion of 6th anniversary of Mongolian Fruit and Berries Sector Academic Conference, 2014.
14. Sainzaya Ts, Undarmaa D. Some results of study on the main harmful seabuckthorn flies spread on western part of the country. ARI magazine. №,2014:12(01):34-138.
15. Sherbakov MV. Мухи-Пестрокрылки юго-востока западной Сибири: предварительные итоги и перспективы исследований. X Всероссийский диптерологический симпозиум. Краснодар, 2016, 342-347.

16. Arturs Stalazs, Maksims Balalikins. Proceedings of the Latvian academy of Sciences. Section B,2017:71(3)(708):103-110
17. Xing-Jian Wang 1996. The fruit flies (Diptera: Tephritidae) of the East Asian region. Acta zootaxonomica Sinica, 188,189.
18. The *Carpomyni* Fruit flies (Diptera: Tephritidae) of Europe, Caucasus and middle east: new records of pest, with improved keys. Vestnik zoologii 51(6), 453-470.
19. Dominykas Aleknavicius, Vincas Buda. Trapping peculiarities, flight and mating dynamics of sea buckthorn fruit fly (*Rhagoletis barava*) in Lithuana. Zemdirbyste Agriculture,2019:106(1):81-86.
20. Burcu ÖZBEK ÇATAL, Asime Filiz ÇALIŞKAN KEÇE2, Mehmet Rıfat ULUSOY. Determination of the Species of *Tephritidae* family (Diptera) on Cherry Orchards in Adana Province and Surroundings in Turkey. KSÜ Tarım ve Doğa Derg,2019:22(3):492-497.
21. Ian M. White and Marlene M. Elson- Harris. Fruit flies of economic significance: Their identification and bionomics, 1994.
22. Zeynalov AS. Features of Bioecology of sea buckthorn flies *Rhagoletis batava* Hering in the Central Non-Chernozem Region of Russia. Russian Agricultural Sciences,2018:44(4):335-339.