Anew host of dodder (*Cuscuta spp*.) Parasitizing Damas (*Conocarpus erectus*) in Khartoum and Gezira states-Sudan

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Abstract- The study was carried out at the field dodder during season 2017 - 2018 in Khartoum and Gezira states to determine its all host of *Cuscuta spp* distributed in the two states using Global *Positioning System* (GPS) in the survey. The survey covered several areas in two states. The results showed that dodder species founded parasitizing in the North, East and West Khartoum state. The results revealed that the dodder have different host plants and new host (Damas *Conocarpus erectus)*. It was founded parasitizing 12 plants species belonging to 12 families. Among the most affected host plants, were 6 grasses, 2 vegtables Crops (Onion, *Allium cepa*) and Molokhia (*Corchorus oletorus*), lime trees (*Citrus aurantiifolia*), forge Crops (Alfalfa, *Medicago sativa*), forest trees (Ghoubish, *Guiera seneglensis*, Damas) and Orumentals (*Euphorbia Catharanthu svinca*).High percentage incidence (100%) were recorded in Damas, Alfalfa, Molokhia, -Ramtook (*Xanthium baraslicum)*. Lowest percentage incidence was recorded in Lime 1%. Results of Gezira state indicated that the dodder was found Parasitizing on North, East and West of the state. The host of it was Onion, Lokh *Dicanthium annulatum* and Dahaser *Indigofera oblongifolia*. Lowest percentage incidence 6.2%, were observed in onion.

Index Terms- Cuscuta, Host range, Dodder, Percentage, Incidence

I. Introduction

Dodder (*Cuscuta spp*.), an annual holoparasitic plant of legume crops, which belongs to family *Cuscutaeceae* ,is genus cosmopolitan occurrence , thus *Cuscuta* species are widely distributed and colonized diversity of habitats throughout the temperate and tropical zones (Belize,1987). Many species of *Cuscuta* have been introduced to different parts of the world due to similarity of their seed to those of commercial crops ,especially legumes like alfalfa (*Medicago sativa* L.) *Cuscuta species*, commonly known as dodder and it is one of the most invasive weeds, (Lowe et *al*., 2001).This survey was made in Khartoum& Gezira state.

Filed dodder have wide spectrum of hosts, although they favor less monocotyledonous species genus *Cuscuta* contains three subs –geneses. Member of sub-genus destroy fruit trees, while the species in sub- genus *Cuscuta* represents a problems for hosts of herbaceous plants ,as well as sub- genus grammica infected plans weaken ,vegetative luxuriance is reduced ,as well as their fertility (Koskela *et al.,* 2001 ,Fathoulla and Duhoky ,2008).In moderate climate ,filed dodder is maybe the most parasitic weeds of legumes. Genus *Cuscuta* belongs to family (*Cuscutaceae*).Many species that are hardly recognizable and are able to parasite numerous shrubby and woods species belong to this genus. Although the results of the mitochondrial genome analysis confirmed a link between the family Cuscutaaceae phylogentically belongs to family Convolvaceae .Stojanovic *et al.*,(2002), Stojanovic *et al.* (1993) The species of the genus *Cuscuta* (*Cuscutacea*e) are most obvious parasitic .Dodder are vien that usually have bright colors orange, yellow or red characteristics of calyx and corolla lobes are important, identifying 8 species (Musselman, 1984).New taxonomy of the genus *Cuscuta* exclude it from the family *Convolvulaceae* to a separate family .Dodder are abundant in Europe, Africa but less in Australia. It also present in Asia, commonly in south India to SriLanka and etas to china and Indonesia .It may have been introduced and become established occasionally. Holm *et al.* (1979) Classified *Cuscuta reflexa* as serious weed in Afghanistan, Nepal, India and Pakistan .In Sudan the study from (Andrews, 1956), Indicated that about four species of *Cuscuta: namely C. Planifora ten*: *C. hyaline* Roth: C. *klimanjara oliv* and *C. Cordofana*, while Musslman (1984), reported seven species and described their geographical distribution in country .He reported the occurrence of *C. pedicellata* ladeb, In Khartoum, Gezira and Bahr Al Gazal state, and *C . pedniflora Ten* .In southern Darfur and Red Sea state he found *C. Hyaline* and in the Northern States, Kassala, Northern Kordofan and Khartoum States. Musslman and Bebawi, (1983) reported *C.campestris* yunker, in Shambat and Toti Island and widely spread through much of Sudan as a contaminate of Lucerne seeds**.** Since Gaunter, (1950) review on the genus *Cuscuta* it is in considered as the most serious weeds in alfalfa, clover and other legumes. It also attacks other plants including flax and many ornamental plants .*Cuscuta campestris* infect tomatoes, onion, asparagus and cucurbits. Dodder species

vary in the number of different host species they can infect. *Cuscuta campestris* is the most widespread species in the world and the only parasitic weed of North America that has spread to the Old World (Dawson *et al*., 1994). However, field dodder in Gezira, central Sudan, parasitizes onion, some vegetable crops, broadleaf weeds and it was found to infect lime trees; a woody species. (Jayasinghe *et al*., 2004) .reported that field dodder parasitizes 161 species of different life-forms belonging to 59 families comprising 27 crops, 22 weeds, and 60 medicinal plants. Of the recorded hosts, 24 were trees, 42 were shrubs, 12 were creepers and 83 were herbs. The same authors indicated that *Cuscuta* differentiates between primary and secondary hosts and considered grasses as secondary host of *Cuscuta*. These indicated that habitat differences of the *Cuscuta* species can be responsible for the different host ranges (it only wraps around grasses but does not parasitize them) (Dawson, *et al*., 1994: Holm *et al*., 1997; Hutchison and Ashton, 1980; Parker and Riches, 1993). The same crop may serve as a host of several dodder species, and in some cases dodder can parasitize different plants simultaneously (Cudney *et al*., (1992); Dawson, (1984); Peters *et al.,* (1988).In previous studies, field dodder infestation reduced tomato vegetative growth and the number of fruits per plant but had no effect on individual tomato fruit size or maturation (Lanini, 1992). The current research is aimed to: a) determine the natural host range of field dodder (*Cuscuta spp*.) distributed in Khartoum and Gezira states, b) evaluate the effects and estimate the percentage incidence in these states.

II. Materials and Methods

Survey

Two surveys were carried out during November 2017 to March 2018 in Khartoum and Gezira States to determine host range of *Cuscuta spp*. in the two States. Global *Positioning System* (GPS) using in the survey. Each survey includes some areas in each state.

The first survey was conducted in November 2017 in Khartoum State include: (Shambat, Alkabash, Alfaki- hashim, Algeli, Helat-koko, Alalaphon, Alslaet scheme, Jebal-Aulia, Sowba scheme, Gezira Slang, Algomuai scheme ,Omdurman Dar Alslam, Taglawi Scheme ,Gezira slang andToti) The other survey was carried out in March 2018 In Gezira State include areas: (Wad Alkawahala, Oum Treebat, Wad Alhandi, Shukaba , Wad Almagzoub, Alhasaheisa, Abu usher, Hantoob, and Almadina Arab)(Fig. 1) and The host plants of *Cuscuta spp.* were collected from different localities of two States Khartoum and Gezira identified by using recent standard books and scientist in weed science. The hosts were categorized according to their families. For each survey *Cuscuta* incidence were evaluated .The percentage of infection was recorded for each host at each locality and the data were statistically analyzed. The calculations were based on the following formula:

$$\text{Incidence} = \frac{\text{No. of infected plants}}{\text{Total No. of plant inspected}} \times 100$$

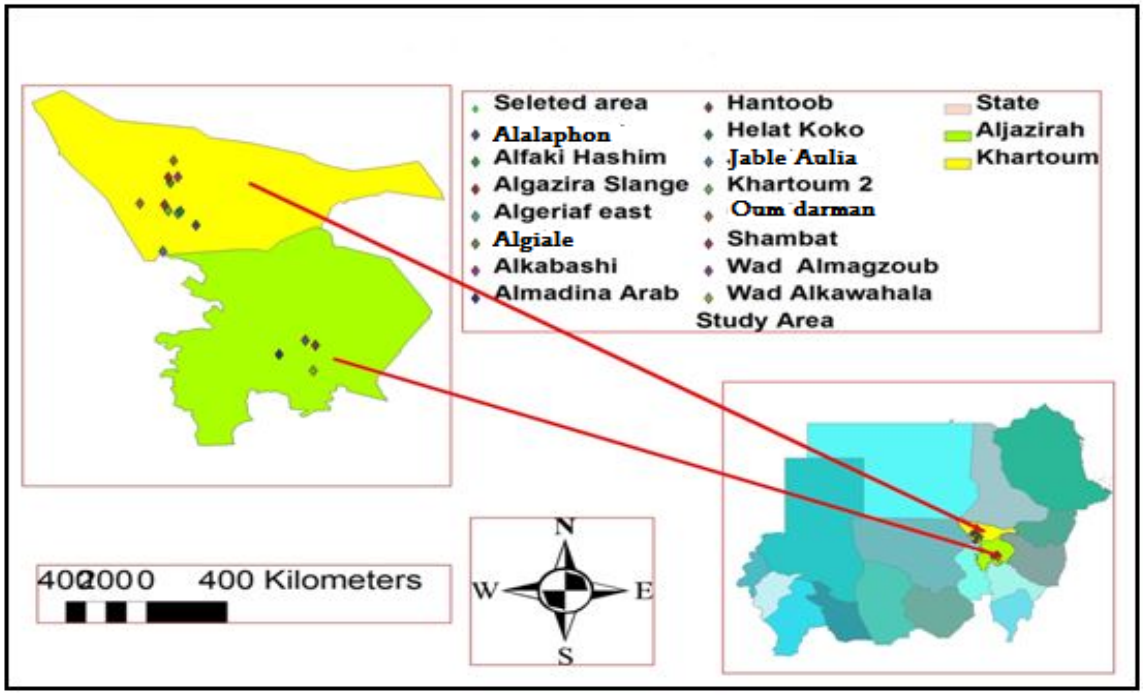

Fig. 1. Map of Khartoum and Gezira States showing the surveyed areas.

III. Results

The results in **Table** (1) showed that dodder species founded parasitizing in the North Khartoum state (Shambat, Alkabash, Alfaki-hasham, Gezira Slang and Algeli).The South Khartoum (Sowba-west, Jebal-aulia, and Algomuai-Scheme), while in areas of Sowba, and Algomuia-Scheme infestation not recorded. Whereas, it was found in the East Khartoum (Alslaet-scheme, Helat-koko, and Alalaphon) parasitized on different host. On the other hand, it was found restricted on citrus plants especially lime at west Khartoum areas (Dar Alslam Om bada, Taglawi Scheme). The results revealed that the dodder have different host plants, including weeds, crops , vegetables, ornamentals, and other plants throughout the agricultural areas in the Khartoum state. However, the most Parasitism was founded around rivers Nile and its tributaries (White and Blue) but it was not observed far away the Nile (**Fig.** 2, 3, 4, and 5)

Results of Gezira state areas South state (Wad Alkawahala, Oum Treebat, Wad Alhandi, and Shukaba,) indicated that the dodder was not present except in Oum Treebat, Wad Alhandi, and Shukaba areas. As for the Gezira North (Wad Almagzoub, Hantoob, Alhasaheisa, and Abu usher) the parasite only was observed in Wad Almagzoub and Hantoob area**s (Table 1, Figs 6, 7, 8 and 9**).

Table 1. Host Plants of dodder (*Cuscuta spp*.) recorded in Khartoum and Gezira states.

Locality/area	**Coordinates**	**Altitude(m)**	**Host plant**
Bahari/Shambat	N153850.1 E0323036.9	389	Alfalfa/Balloon plant/Euphorbia
Alsalam/Dar Alsalam	N153933.5 E0322043.0	424	Lime
Khartoum /Kartoum2/Toite	N153550.8 E0323209.3	387	Damas /Remet/ Alfalfa
Bahari(N)/Alkabash	N155309.9 E0323551.0	390	Alfalfa
Bahari(N)/Alfaki- hasham	N155011.8 E0323300.0	384	Alfalfa
East Nile/Helat-koko	N153531.3 E0323658.0	394	Ghoubish
East Nile/Alalaphon	N152818.4	396	Alfalfa / Dahaser

	E0324315.2		
East Nile/Algerif east	N153419.8 E0323554.3	384	Alfalfa
Jebal Aulia	N151455.1 E0322959.2	394	Ramtook/Molokhia/ Amoyogha
Algeli/Algeli	N160132.7 E0323410.0	390	Alfalfa
Kerri North/Slang	N155256.5 E0323211.2	385	Alfalfa
Gezira /Hantoob	N142634.8 E0333106.4	415	Alfalfa /Onion
South Gezira/Wad Kawahala	N141324.1 E0333024.7	419	Onion
North Gezira/Wad Almagzoub	N142858.8 E0332713.9	415	Onion
West Gezira/Medina Arab	N142144.1 E0331640.2	411	Onion/Lokh/Dahaser

Result in **Table 2** showed incidence of filed dodder. High percentage incidence (100%) were recorded in Khartoum state as the following (Khartoum2 Damas , Algile Alfalfa, jebal Auila Molokhia, Jebal Auila- Ramtook, and Jebal Auila- Amoghoga ,Toti Remet- Alalaphon,Alafalfa ,Shambat- Euphorbia and Shambat- Balloon plant), and Dar Alslam Om bada- Lime) respectively. In Geziar state were recorded high incidence (Hantoob- Alfalfa, Almadina Arab -Onion, and Almadina Arab-Dahaser) respectively, However, the lowest incidence were recorded in Khartoum state as (Shambat Lime 1%, Alfaki hashem Alfalfa 2.4%, East Nile Algerif Dahaser 6.3%, and Gezier Aslange Alfalfa 6.3 %).Also the lowest incidence were recorded in Gezira state areas (wad Al kawahala- Onion 6.2%, Hantoob-Onion 14.3% and Wad Almagzoub -Onion 22.2).

Table 2. Incidence of *Cuscuta spp* in Khartoum and Gezira states.

No	Scientific name	Local name	Family	Incidence
1	*Conocarpus erectus*	Damas	Combretaaceaes	100%
2	*Guiera seneglensis*	Ghoubish	Combretaaceaes	70.9%
3	Medicago sativa	Alfalfa	Fabaceae	6.3%
4	Medicago sativa	Alfalfa	Fabaceae	100%
5	*Xanthium baraslicum*	Ramtook	Asteraceae	46%
6	*Tephrosia spp*	Amoyogha	Fabaceae	100%
7	*Corchorus oletorus*	Molokhia	Malvales	100%
8	*Xanthium baraslicum*	Ramtook	Asteraceae	100%
9	*Medicago sativa*	Alfalfa	Fabaceae	2.4%
10	*Medicago sativa*	Alfalfa	Fabaceae	100%
11	*Medicago sativa*	Alfalfa	Fabaceae	6.3%
12	*Medicago sativa*	Alfalfa	Fabaceae	100%
13	*Bergia cepansis*	Remet	Amaranthaceae	2.7%
14	*Citrus aurantiifolia*	Lime	Rutaceae	1%
15	*Catharanthu svinca*	Euphorbia	Apocynaceae	100%
16	*Medicago sativa*	Alfalfa	Fabaceae	25%
17	*Cardiospermum halicacobum*	Balloon plant	Sapindaceae	100%
18	*Medicago sativa*	Alfalfa	Fabaceae	37.5%
19	*Indigofera oblongifolia*	Dahaser	Fabaceae	37.5%
20	*Citrus aurantiifolia*	Lime	Rutaceae	100%
21	*Allium cepa*	Onion	Liliaceae	12.5%
22	*Allium cepa*	Onion	Liliaceae	6.2%
23	*Allium cepa*	Onion	Liliaceae	14.3%
24	*Medicago sativa*	Alfalfa	Fabaceae	100%
25	*Allium cepa*	Onion	Liliaceae	22.2%

26	*Allium cepa*	Onion	Liliaceae	100%
27	*Indigofera oblongifolia*	Dahaser	Fabaceae	100%
28	*Dicanthium annulatum*	Lokh	Poaceae	76.9%

Fig.2.The parasite on Damas (*Conocarpus erectus)* location: Khartoum2

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Fig.3. The parasitic on Ramtook *(Xanthium barasilicum*) Location: Khartoum Jebal Auli.

Fig. 4. The parasitic on Balloonplant (*Cardiospermum halicacobum)*location:khartoum shambt.

Fig. 5.The parasitic on Alfalfa (*Medico sativa*) Location: Hantoob.

Fig..6The parasiticon lime cutri(*Citrus aurantiifolia*) location :khartoum Dar alsam

Fig.7. The parasitic on Onion (*Allium cepa*) location Geziar Madina Arab.

Fig.8. Parasitic on Dahaser (*Indigofera oblognifolia)* location :Gezaira madina arab.

Fig. 9. The parasitc on lokh (*Dicanthium annulatum)* location:geazira madina arab.

IV. Discussion

The results showed that dodder species founded parasitizing on different plant hosts in the different areas in Khartoum and Gezira states. The results revealed that the dodder have different host plants and new host such as *Conocarpus erectus* in Khartoum State and showed that field dodder parasitizing 13 Plants Species belonging to 12 Families. Among these hosts, 6 grasses, 2 Vegetables Crops (*Allium cepa* and *Corchorus oletorus*), lime trees (*Citrus aurantiifolia*), forge Crops

(*Medicago sativa*), and forest trees (*Guiera sp*) and ornamentals (*Euphorbia sp)*. However the results were findings in agreement with Zaroug *et .al*., 2010. who Founded dodder parasitizing 19 plant species belonging to 12 families among the most affected hosts, were 5 vegetable crops (onion, tomato, chickpeas, Jews mallow and salad rocket).and fruit trees (lime) also were agreement with Jayasinghe *et-al* (2004) who reported that field dodder parasitizes 161 species of different life-forms belonging to 59 families comprising 27 crops, 22 weeds, and 60 medicinal plants. Of the recorded hosts, 24 were trees, 42 were shrubs, 12 were creepers and 83 were herbs, the same authors indicated that *Cuscuta* differentiates between primary and secondary hosts and considerable grasses as secondary host of *Cuscuta* .these indicted that habitat differences of the *Cuscuta* species can be responsible for the different host ranges. Furthermore, it was found that the reason why dodder parasitize plants from various life, forms in different proportion is not (only) the active host choice, but the characteristic features of the habitats .Dawson.*et .al* .,1994; Holme *et.al*., 1997; Hutchison and Ashton 1980;they reported that dodder mainly parasitizes alfalfa ,but also attacks some horticulture crops, legumes and broadleaf weeds ,though it is seldom found on woody plants, grasses, or cereals. The incidence persnce of filed dodder were estimated to according of infection evelueted and recorded as the following (total number of plants infected related to the total number of plants inspected (infection %). High percentage incidence (100%) was recorded in Khartoum state (Khartoum 2, Algile, jebal Auila, Toti, Alalaphon, Shambat, and Dar Alslam Om bada). On the other hand, lowest percentage incidence was recorded in Lime at Shambat area (1%). Results of Gezira state indicated that the dodder was found Parasitizing on North, South and West of the state. The host plants of it were Onion, Lokh, Alfalfa and Dahaser. Highest incidence (100%) was recorded in Gezira state at Hantoob and Madina Arab, while the lowest incidence was recorded at wad Al kawahala area (6.2%).

V. Conclusion

The study explained the levels of susceptibility to dodder in Khartoum and Gezira states. The high level of diversity host range to this pest suggests a potential threat to human interests in their cultivation in dodder-infested fields. It will be essential to understanding the basis of the *Cuscuta*-host interaction and may thus, advance knowledge about this parasitic weed in general. From this foundation, new strategy for controlling parasitic weeds may evolve.

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