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Department of Plant Protection

The Parasitic Plant Dodder (*Cuscuta* spp)in the world and Sudan:Areview

نبات الحامول الطفيلي في العالم والسودان :مرجعية ادبية

A Thesis submitted in partial fulfillment of the requirement for B .Sc (Honors) in
plant protection.

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Dedication

To my family , friends, collegeous with
love and respect

Acknowledgement

In the beginning, thanks be to Almighty Alla , who helped me to accomplish this work..

I am greatly intended and appreciation from me to my superviosor Dr.Mawhib Ahmed El siddig for her help and guidance during this work.

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No matter how many words of thanks I offer, I cannot fulfill your right ,because you did a lot for me and gave me my hand without waiting for my sincere thanks and appreciation to my family and friends .

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Abstract

Dodder can be identified by its thin stems appearing leafless, with the leaves reduced to minute scales. In these respects it closely resembles the similarly parasitic, but unrelated genus, *Cassytha*. Some species such as *Cuscuta reflexa* can photosynthesize slightly, while others such as *Cuscuta europaea* are entirely dependent on the host plants for nutrition. The color of the stem is red, yellow, and orange. Dodder flowers range in color from white to pink to yellow to cream. The seeds are minute and produced in large quantities. They have a hard coating and typically can survive in the soil 5-10 years, sometimes longer. Dodder was found among 150 localities surveyed, 80 were found infested by the field dodder. A host range of dodder includes alfalfa, sugar beet, tobacco, potato, lentil, parsley, onion, and besides the crops, 18 weed species were also recorded. Dodder reduced both quantity and quality of sugar beet yield. People use the parts that grow above the ground to make medicine; it is also used for cancer. Control of dodder is achieved by preventive control, biological (using *Fusarium*, *Alternaria*, *Colletotrichum*, and insects), and chemical control by using herbicides.

ملخص الدراسة

يمكن التعرف على الحامول من خلال سيقانه الرقيقة التي تظهر بلا أوراق ، مع تقليل الأوراق إلى مقاييس دقيقة في هذه النواحي ، فإنها تعيد تشكيل النوع الطفيلي المماثل . بعض الأنواع مثل *Cuscuta reflexa* يمكنها البناء الضوئي بشكل طفيف ، في حين ان انواع اخرى مثل *Cuscuta europaea* تعتمد كلياً على النباتات المضيفة للتغذية . يكون لون الساق أحمر وأصفر وبرتقالي .تتنوع ألوان أزهار الحامول من الأبيض إلى الوردى إلى الأصفر إلى الكريمي .البذور دقيقة ويتم إنتاجها بكميات كبيرة ولها طلاء خشن ويمكن ان تعيش في التربة لمدة 5-10 سنوات في بعض الأحيان تزيد . الحامول ما بين 150 منطقة تم مسحها ، وجد 80 منها مصابة بالحامول الحقلي .لها مدى عائلي واسع منها البرسيم ،التبغ ،بنجر السكر ،بطاطس ، عدس ، البقدونس ، البصل ،بالإضافة إلى المحاصيل تم تسجيل 18 نوع من الأعشاب . يقلل الحامول من كمية ونوعية محصول بنجر السكر . يستخدم الأجزاء التي تنمو فوق سطح الأرض لصنع دواء يستخدم ايضاً لعلاج السرطان .ويتم التحكم في الحامول عن طريق الطرق الوقائية ، والمكافحة البيولوجية (استخدام الفيوزاريوم ، الالترناريا ،والكوليتوتريكوم، والحشرات)،والمكافحة الكيميائية عن طريق استخدام مبيدات الأعشاب.

Chapter One

Introduction

Dodder (*Cuscuta*) is a genus of about 100-170 species of yellow, orange or red (rarely green) parasitic plants. The genus is found throughout the temperate and tropical regions of the world, with the greatest species diversity in subtropical and tropical. Dodder can be identified by its thin stems appearing leafless with the leaves reduced to minute scales. Dodder are vines 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 (*Cuscutaceae*). Dodder are abundant in Europe, Africa but less in Australia. It also present in Asia, commonly in south India to Sri Lanka and extends 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. Planiflora* Ten: *C. hyaline* Roth: *C. klimanjarah* Oliv and *C. Cordofana*, while Musselman (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. pediflora* Ten. In southern Darfur and Red Sea State he found *C. Hyaline* and in the Northern States, Kassala, Northern Kordofan and Khartoum States. Musselman and Bebawi, (1983) reported *C. campestris* Yunker, in Shambat and Toti Island and widely spread through much of Sudan as a contaminant of Lucerne seeds. Since Gaunter, (1950) review on the genus *Cuscuta* it is considered as the most serious weeds in alfalfa, clover and other legumes. It also attacks other plants

In survey in Sudan done by Mahadi,*et al.*(2019) in Khartoum and Gezira States to determine all host of *Cuscuta* spp distributed in the two states using global positioning system (GPS) in the survey. They found that dodder parasitizing 12 plants species belonging to 12 families such as (*Allium cepa* , *Corchorus olecorus* lime trees *Citrus aurantiifolia*, *Medicago sativa* , *Conocarpus erectus*, *Guierasen eglensis* and *Euphorbia catharanthusvinca*).Other survey in Western Darfur States in Sudan (Elgenana),found many host plants of *Cuscuta* spp in many areas in this state (Arbotne, Gagara, Daram, Atherne,Kangot, Bagbag,Ardamata, and Omdoina),found various hosts (*Xanthim baraslicum* , *Eruca sativa* , *Citrus aurantiifolia* and *Amaranthus viridis*) ,and weeds crops, vegetables , ornamentals .However, the most plants that dodder parasite them was found *Xanthim baraslicum*(100%) and *Amaranthus viridis*(60%)(Omer and Mariem,2019).

Control of field dodder should commence as soon initial points of infestation have been a observed , and completed before dodder plants begin to flower set seeds (Dawson , 1987, Dawson *et al* ., 1994).

Preventive control cleaning all nearby plots , field margins , waste grounds , destroying weeds parasitized by field dodder , maintaining irrigation canals dodder -free, spreading rotted manure (Dawson *et al* . ,1994).

Parker (1991) tried to use certain phytopathogenic fungi , bacteria and insects as a biological cpntrol . Bewick *et al.*, (1987) use *Fusarium tricinctum* , *Alternaria* spp and *Colletotrichum gloeosporioides* as a biological cpntrol of dodder.

As a result of haustoria penetration and the formation of a closed host – parasite association it is believed that only strongly selective herbicides are effective enough in destroying the parasite without hurting the host (Fer, 1984) . studies have mostly been focused chemical methods of field dodder control (Dawson ,

1984 , 1987 , parker , 1991 , parker and Riches , 1993). Dinitroaniline herbicides have been used for preventive control of field dodder in alfalfa crops (Orloff and Cudney , 1987) pendimethalin , one of such herbicide , has been found far more effective than trifluralin because its effect it more durable . but trifluralin may also be used as a selective herbicide for control of *Cuscuta indecora* and *Cuscuta pentagona* in alfalfa crops .It is used in granular formulation that stays close to soil surface in which dodder seeds are expected to germinate .

The aims

identification of the largest number of species of dodder in Sudan and the families that parasitize it .

Chapter two

2.Literature Review

Dodder (*Cuscuta* spp)

2.1 Classification

This article is about a genus in the family Convolvulaceae. It is not to be confused with a similar – looking , unrelated genus *Cassytha* in the Lauraceae .*Cuscuta* is a genus of about 100-170 species of yellow , orange , or red (rarely green) . parasitic plants . Formerly treated as the only genus in the family Cuscutaceae , it now is accepted as belonging in the morning glory family , Convolvulaceae , on the basis of the work of the Angiosperm phylogeny Group . The genus is found throughout the temperate and tropical regions of the world ,with the greatest species diversity in subtropical and tropical regions , the genus becomes rare in cool temperate climates with only four species native northern() .

Kingdom : Plantae – plants

Subkingdom :Tracheobionta – vascular plants .

Superdivision :Spermatophyta – seed plants .

Division :Magnoliopsida -flowering plants

Class :Magnoliopsida –(Dicotyledons) .

Subclass :Asteridae

Order :Solanles

Family :Cuscutaceae

Genus :Cuscuta

Contains 50 Species and 50 accepted taxa overall

Species :*Cuscuta americana* L. – (American dodder)

Species :*Cuscuta indicora*

Species :*Cuscuta planifor*

Species :*Cuscuta campestris* (<https://plants.usda.gov/java/classification> /
USDA PLANTS

<https://plants.usda.gov>)

2.2 Description

Dodder can be identified by its thin stems appearing leafless, with the leaves reduced to minute scales. In these respects it closely resembles the similarly parasitic, but unrelated genus, *Cassytha*. In early autumn, the vines can produce small fruit that take the same color as the vine, and are approximately the size of common pea. It has very low levels of chlorophyll. Some species such as *Cuscuta reflexa* can photosynthesize slightly, while others such as *Cuscuta europaea* are entirely dependent on the host plants for nutrition. The stem color may be yellow or orange stem.

Dodder flowers range in color from white to pink to yellow to cream. Some flower in the early summer other later, depending on the species. The seeds are minute and produced in large quantities. They have a hard coating and typically can

survive in the soil 5-10 years sometimes longer .Dodder seeds sprout at or near the surface of the soil. Although dodder germination can occur without a host it has to reach a green plant quickly and is adapted to grow towards the nearby plant by following chemosensory clues if a plant is not reached within 5 to 10 days of germination, the dodder seedling will die before a host plant is reached the dodder , as other plants .

(Musselman, 1984).

2.3 Distribution and host range

2.3.1 Distribution and host range in the world

A survey of *Cuscuta reflexa* was made at 20 sites in the Kathmandu valley where it is a common plants parasite .Total of 29 plant species , representing 28 families , is reported as being either primary (13 species) or secondary hosts (26 species) Historical development occurred on 37 species but was not present on two grasses .A positive correlation existed between the intensity of infestation , status of the host and haustorial development .

Species of the parasitic plant genus dodder (*Cuscuta spp*) are distributed worldwide .They are able to attack many plant species including crops that important to the people of adamawa state. The host range of this weed is not entirely known yet, such understanding is particularly important with respect to valuable crops grown in this area.

Dodder extracts all its nutrients and water requirements from the host plant and shades the crop with its dense stem , thereby reducing crop yields .The host range of *Cuscuta campestris* among different food crops , and the levels of damage is causes on each host a pot experiment was conducted in screen house of the ModibboAdama university of Technology ,Yola ,Adamawa State , Nigeria .Nine

different crops were used: Cotton (*Gossypium herbaceum*.L),pepper(*Capsicum annum.*) Tomato(*Solanum lycopersicum.*), Soybean (*Glycine max* L.), cowpea (*Vigna unguiculata* L. walp),Groundnut(*Arachis hypogaea* L.),Sorghum(*Sorghum bicolor* L.),Maize(*Zea mays* L.) and Rice(*Oryza sativa* L.) (Musselman, 1984).

During 2002-2004 field surveys of field (*Cuscuta campestris* yuncker) in croplands were done in south western Slovakia . From among 150 localities surveyed, 80 were found infested by the field dodder .Within crop plants, *Cuscuta campestris* infested sugar beet (*Beta vulgaris*),alfalfa(*Medicago sativa*) , tobacco (*Nicotiana tabacum*) ,potato(*Solanum tuberosum*) , lentil (*Lens esculenta*) ,parsley (*Pastinaca sativa*)and onion (*Allium cepa*) .Besides the crops ,18 weed species were also recorded, the species from the genus polygonum (Polygonaceae) were the most important and acted as a significant reservoir of field dodder in cropland .*Cuscuta campestris* was not found in cold climatic regions with altitude higher than 240m. The impact of field dodder infestation on sugar beet yield was studied during the year of 2004 in the two localities (Salov and zitave) in south western Slovakia .the decline was the same at both localities.

2.3.2 Distribution and host range in the Sudan

In survey in Sudan done by Mahadi,*et al.*(2019) in Khartoum and Gezira States to determine all host of *Cuscuta* spp distributed in the two states using global positioning system (GPS) in the survey. They found that dodder parasitizing 12 plants species belonging to 12 families such as (*Allium cepa* , *Corchorus olecorus* lime trees *Citrus aurantiifolia*, *Medicago sativa* ,*Guierasen eglensis*, Damas *Conocarpus erectus* and *Euphorbia catharanthusvinca*). High percentage incidence (100%) were recorded in *Conocarpus erectus*, *Medicago sativa* and *Xanthium baraslicum*,. Lowest percentage incidence was recorded in *Citrus*

aurantiifolia 1%. Results of Gezira state indicated that the dodder was found parasitizing on North, East and West of the State (Mahdi *et al.*, 2019).

In Western Darfur States in Sudan (Elgenana), found many host plants of *Cuscuta spp* in many areas in this state (Arbotne, Gagara, Daram, Atherne, Kangot, Bagbag, Ardamata, and Omdoina), found various hosts (*Xanthimbaraslicum* , *Eruca sativa* , *Citrus aurantiifolia* and *Amaranthus viridis*) ,and weeds crops, vegetables , ornamentals .However, the most plants that dodder parasite them was found *Xanthim baraslicum*(100%) and *Amaranthus viridi*(60%)(Omer and Mariem, 2019 un published data) .

2.4 Economic importance

The presence of field dodder markedly reduced both ,quantity and quality of sugarbeet yield ,weight of heaving infested beets was reduced from 21.0 to 37.4 % . and sugar content from 12.6 to 15.2% .

Such decline of both parameters was also recorded when field dodder together with leaves removal was during growing season at the end of July . Although the leaf area of sugar beet regenerates ,the decrease of quality and quantity was observed (Jayasinghe, *et al.*, 2014).

2.5 Control

2.5.1 Control

Based on the importance of field dodder and damage that it is able to cause ,it has been categorized as a quarantine plant parasite in many countries , and Serbia too

(IAlist ,2010) making its suppression mandatory throughout the country . Attention should primarily focus on field crops . control of field dodder should commence as soon as initial points of infestation have been abserved , and completed before dodder plants begin to flower and set seeds . Once its seeds have fallen on the ground the species becomes a permanent threat to crops .Various options for control of field dodder are available: ,

2.5.2 Preventive control of field dodder

Preventive control is one of the most important and fundamental activities in any field dodder control strategy, which focuses primarily on prevention of plot infestation by : (1) cleaning all nearby plots , (2) cleaning field margins , (3) cleaning waste grounds , (4) destroying weeds parasitized by field dodder , (5) maintaining irrigation canals dodder -free , (6) spreading rotted manure , (7) hand weeding dodder plants in small areas , taking good care of the removed plants because dodder seedlings are able to survive only a few days without a host ,while fully developed plants removed with their host are able to retain freshness up to a couple of weeks , (8) checking on potentially infest able crops at 15 days intervals to detect infestation in an early stage and take adequate control measures , (9) long term crop rotation , once the presence of field dodder will not germinate at low temperatures (Dawson *et al* .,1994).

2.5.3 Biological control of field dodder

Parker (1991) tried to use certain phytopathogenic fungi , bacteria and insects for biological control of several *Cuscuta* species .

Bewick *et al.*,(1987) found several phytopathogenic fungi , including *Fusarium tricinctum* and *Alternaria* spp ., to cause some damage to *Cuscuta gronouii* , while *A. alternata* were harm full to *Cuscuta pentagona* .

Besides , li (1987) reported that a conidial suspension of *Colletotrichum gloeosporioides* could be used for selective control of the species *Cuscuta chinensis* and *Cuscuta australis* in soybean crops .

Bewick et al . , (2000) used *Alternaria destruens* to control *Cuscuta gronouii* in field of cranberry (*Vaccinium macrocarpon*) and carrot (*Daucus carota*) , and reduced it up to 90% .

However , the results of similar efforts to control *Cuscuta pentagona* in the same crops were not early as successful in the warm and dry climate of California (Lanini , 2004) .

Saric and Bozic (2009) and saric *et al.*, (2009) tested the influence of soil microorganisms (PGPR – Plant Growth Promoting Rizobacteria) on the germination of field dodder (*Cuscuta campestris* yunck .) and the bacterial cultures of :*B. licheniformis* , *B. pumilus* and *B. amyloliquefaciens* isolated from manure , *B. megatherium* ZP6 isolated from wheat rhizosphere . The results inferred that bacterial cultures of the genus *Bacillus* had different degrees of inhibitory effects on field dodder germination , conversely , the bacterial culture *A. chroococcum* PSL had astimulating effect on seed germination of flowering parasite .

2.5.4 Chemical control

As a result of haustoria penetration and the formation of a closed host-parasite association it is believed that only strongly selective herbicides are effective enough in destroying the parasite without hurting the host (Fer , 1984) . Studies have mostly been focused chemical methods of field dodder control (Dawson , 1984 , 1987 , Parker , 1991 , Parker and Riches , 1993) . Some researchers have reported better results of herbicides treatments before the parasite has attached to its hosts (Cudney et al . , 1992 , Dawson , 1990 a , Orloff and cudney , 1987) .

herbicide treatments prior to dodder attachment are conducted to avoid such attachment and so prevent even the least damage (Parker , 1991). Dinitroaniline herbicides have been used for preventive control of field dodder in alfalfa crops (Orloff and Cudney , 1987) pendimethalin , one of such herbicide , has been found far more effective than trifluralin because its effect is more durable . but trifluralin may also be used as a selective herbicide for control of *Cuscuta indecora* and *Cuscuta pentagona* in alfalfa crops .It is used in granular formulation that stays close to soil surface in which dodder seeds are expected to germinate .

Liquid formulation of trifluralin has not produced such good results in controlling these species in Tomato pendimethalin may also be used for selective control of field dodder in carrot , onion and alfalfa (Orloff and Cudney , 1987). Pendimethalin is less transportable than trifluralin but rainfall and irrigation certainly facilitate its faster incorporation and activity in soil (Parker and Riches,1993) .(Foshiand Raparini ,1977) used ethofumesate to control field dodder in sugar beet .

As the selection of herbicides available for control of field dodder in sugar beet is very restricted , soil herbicides are often used , but practice has revealed their rather poor effects on field dodder . conversely , propyzamide has been identified as a sound solution for field dodder control in sugar beet , depending on infestation intensity (Saric- Krsmanovic and Dobrikovic , 2012) . compounds more and become accumulated mostly in organs of the host plants with higher water potential (Transpiration)and may so harm the host plant more the parasite .

Dawson (1990 b) reported similar good result after applying glyphosate in alfalfa , and Mishra *et al.*, (2004) after treatment of black gram {*Vigna mungo* (L.) Hepper}. Besides , glyphosate has been found effective in controlling *Cuscuta monogyna* vahl on the woody species *Punicagranatum* L. (Bewick et al , 1988) .

Saric-Krsmanovic *et al.* ,(2015) found that glyphosate applied at the rates of 288 and 360 ga.i.ha significantly reduced field dodder in alfalfa crops .

In some other crops , however ,even low amounts of glyphosate are able to harm the host (Orloff and Cudney , 1987) , which prevents adequate control of the parasite (Frolisek , 1987) .

Conclusion

- 1- Dodder (*Cuscuta*) is a genus of about 100-170 species
- 2- Dodder can be identified by its thin stems appearing leafless with the leaves reduced to minute scales.
- 3- New taxonomy of the genus *Cuscuta* exclude it from the family Convolvulaceae to a separate family (*Cuscutaceae*).
- 4- 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.
- 5- In Sudan four species of *Cuscuta*: namely *C. Planifora* ten: *C. hyaline* Roth: *C. klimanjara* oliv and *C. Cordofana*, *C. pedicellata* ladeb, *C . pedniflora* Ten.
- 6- Various options for control of field dodder are available :prevention, biological control and chemical control.

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Appendices

Appendix (1)

Classification of dodder

Kingdom : Plantae – plants

Subkingdom :Tracheobionta – vascular plants .

Superdivision :Spermatophyta – seed plants .

Division :Magnoliopsida -flowering plants

dClass :Magnoliopsida –(Dicotyledons) .

Subclass :Asteridae

Order :Solanles

Family :Cuscutaceae

Genus :Cuscuta

Contains 50 Species and 50 accepted taxa overall

Species :*Cuscuta americana* L. – (American dodder)

Species :*Cuscuta applanata*engelm . –(Gilariver dodder)

Species :*Cuscuta approximate*Bab. – (Alfalfa dodder)

Species :*Cuscuta attenuate*waterf. – (Tapertip dodder)

Species : *Cuscuta boldinghii* Urb. – (Boldingh, s dodder)

Species : *Cuscuta brachycalyx* (Yunck.) – (Yunck .sanjoaquin)

Variety : *Cuscuta brachycalyx* (Yunck.) _Yunck. Var .apoduntherayunck.yunck.

Sanjoaquin dodder

Variety : *Cuscuta brachycalyx*(Yunck.) yunck. Var .brachcalyx _ san joaquin

Dodder

Species : *Cuscuta californica* Hook. Arn _chaparral dodder

Variety : *Cuscuta californica* Hook . Arn .var apiculate engelm _chaparral

Dodder

Variety : *Cuscuta californica* Hook . Arn . var brevifloraengelm _chaparral

Dodder

Variety : *Cuscuta californica* Hook . arn .varcalifornica .chaparra Dodder

Variety : *Cuscuta californica* Hook . arn . var papillosayunck .chaparral

Species : *Cuscuta cassytoides* Nees ex Englem .African dodder

Species : *Cuscuta ceanothi* Benr .canyon dodder

Species : *Cuscuta cephalanthi* Englem .buttonbush dodder

Species : *Cuscuta compactajuss* .ex choisy _compact

Variety : *Cuscuta compactajuss* .:ex choisy _var compacta _compacta Dodder

Variety : *Cuscusta compactajuss* . ex choisyvar .efimbriatayunck _compact

Dodder

Species : *Cuscuta coryli* Engelm .nazel dodder

Species : *Cuscuta cuspidate* Engelm -cusp dodder

Species : *Cuscuta decipiens* yunck .trans _pecos dodder

Species : *Cuscuta dentatasquamata* yunck .lospinitos dodder

Species : *Cuscuta dentatasquamata* Engelm . desert dodder

Variety : *Cuscuta dentatasquamata* Engelm .var denticulate deser dodder

Species : *Cuscuta epilinumweine* _(flax dodder)

Species : *Cuscuta epithymum* (l.) L._(clover dodder)

Species : *Cuscuta erosa* yunck . – (sonoran dodder)

Species : *Cuscuta europaea* L. _(greater dodder)

Species : *Cuscuta exaltata* Engelm _ (Taal dodder)

Species : *Cuscuta fasciculata* yunck(clustered dodder)

Species : *Cuscuta globulosa* benth _(Westindian dodder)

Species : *Cuscuta glomeratechoisy* _(Rope dodder)

Species : *Cuscuta gronoviiwilld* . ex schult _ scaldweed

Variety : *Cuscuta gronoviiwilld* . ex schult.var calyprate Engelm _scaldweed

Variety : *Cuscuta gronovii* will . ex schult .var .gronovii .scaldweed

Species : *Cuscuta harperi* small _(Harpers dodder)

Species : *Cuscuta howellianap* .Rubtzov .(Boggslake dodder)

Species : *Cuscuta indecora* choisy .(bigseedalfadodder)

Variety : *Cuscuta indecora* choisy .var .bifida yunck _(bigseed alfalfa dodder)

Variety : *Cuscuta indecora* Choisy . var . *indecora* _ (bigseed alfalfa)

Variety : *Cuscuta indecora* Choisy . var . *longisepala* Yunck _ (bigseed dodder)

Variety : *Cuscuta indecora* Choisy . var . *neuropetala* (Engelm .) Hitchc _ (bigseed Dodder)

Species : *Cuscuta japonica* Choisy _ (Japanese dodder)

Species : *Cuscuta leptantha* Engelm _ (slender dodder)

Species : *Cuscuta megalocarpa* Rydb . (bigfruit dodder)

Species : *Cuscuta mitriformis* Engelm _ (Cochise dodder)

Species : *Cuscuta obtusiflora* Kunth _ (Peruvian dodder)

Variety : *Cuscuta obtusiflora* Kunth var . *glandulosa* Engelm _ (Peruvian Dodder)

Species : *Cuscuta odontolepis* Engelm _ (Santarita mountain dodder)

Species : *Cuscuta pentagona* Engelm (fiveangled dodder)

Variety : *Cuscuta pentagona* Engelm _ var . *glabrior* (Engelm.) Gandhi, R. Thomas & S. I. Hatch _ (bushclover dodder)

Variety : *Cuscuta pentagona* Engelm _ var . *pentagona* _ (fiveangled dodder)

Variety : *Cuscuta pentagona* Engelm _ var . *pubescens* (Engelm .) Yunck .
(bushclover dodder)

Species : *Cuscuta plattensis* A . Nelson _ (prairie dodder)

Species : *Cuscuta polygonorum* Engelm _ (smart weed dodder)

Species : *Cuscuta potosinaschaffn* _ (globe dodder)

Variety : *Cuscuta potosinaschaffn* . var . *globifera* Yunck . _ (globe dodder)

Species : *Cuscuta reflexa* Roxb _ (giant dodder)

Species : *Cuscuta rostrata* Shuttlw . ex Engelm . & A. Gray _ (beaked dodder)

Species : *Cuscuta runyonii* Yunck _ (Runyon, s dodder)

Species : *Cuscuta salina* Engelm _ (saltmarsh dodder)

Variety : *Cuscuta salina* Engelm . var . major Yunck _ (goldenthread dodder)

Variety : *Cuscuta salina* Engelm . var . papiiatayunck _ (goldenthread dodder)

Variety : *Cuscuta salina* Engelm . var . salina _ (saltmarsh dodder)

Species : *Cuscuta sandwichiana* Choisy _ (kauna, oa dodder)

Species : *Cuscuta squamata* Engelm _ (scaleflower dodder)

Species : *Cuscuta suaveolens* Ser _ (fringed dodder)

Species : *Cuscuta suksdorfii* Yunck _ (mountain dodder)

Variety : *Cuscuta suksdorfii* Yunck . var . suksdorfii _ (mountain dodder)

Species : *Cuscuta tuberculata* Brandegee _ (tubercle dodder)

Species : *Cuscuta umbellata* Kunth _ (flatglobe dodder)

Species : *Cuscuta veatchii* Brandegee _ (veatch, s dodder)

Species : *Cuscuta warneri* Yunck _ (warner, s dodder)



Picture1:explain the parasitism of the alfalfa dodder at the beginning of growth .



Picture 2: demonstrates parasitism of dodder on alfalfa and onions .



Picture 3: demonstrates parasitism of dodder on lemon and onion(2019).



Picture 4: demonstrates parasitism of dodder on alfalfa(2019).



Picture 5: demonstrates dodder and mallow growth water (2019).



Picture6: demonstrates the growth of dodder and alfalfa?(2019).



Picture7:demonstrates parasitism on alfalfa(2019)