



بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

Sudan University of Science and Technology

College of Agricultural Studies

Department of Plant Protection



Survey of Dodder (*Cuscutaspp*) in Khartoum state

مسح لحشيشة الحامول في ولاية الخرطوم

**A thesis submitted in partial fulfillment of the requirements
of B. Sc. Agric. (Honor) for the degree in plant protection**

By:

Rawya Alzber Abshr Kharef

Supervisor:

Dr. Mawahib Ahmed Elsiddig

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الآية

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قال تعالى :-

قُلْ هَلْ نُنَبِّئُكُمْ بِالْأَخْسَرِينَ أَعْمَالًا ﴿١٠٣﴾ الَّذِينَ ضَلَّ سَعِيُهُمْ فِي
الْحَيَاةِ الدُّنْيَا وَهُمْ يَحْسَبُونَ أَنَّهُمْ يُحْسِنُونَ صُنْعًا ﴿١٠٤﴾

صدق الله العظيم

سورة الكهف الآيات 103-104

Dedication

To my father,

To my mother

To my brothers and sisters

To my Teachers

With love

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Thanks extend also to the staff of the Department of Plant Protection, College of agricultural studies, Sudan University of science and technology.

Above all I render my thanks and praise to AlmightyAlla who has given me the strength to acomplish this work.

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ملخص البحث

أجريت هذه الدراسة بهدف عمل مسح عام لحشيشه الحامول في ولاية الخرطوم لمدة خمس شهور بغرض التعرف على العوائل المختلفة لهذه الحشيشة . وقد شملت الدراسة كثير من المناطق في الولاية .

هذه الدراسة اثبتت تطفل الحامول علي انواع مختلفه من العوائل النباتيه ونباتات الزينه أهمها نبات الليمون , نبات البرسيم, نبات الملوخيه, نبات الدمس, نباتات الزينه مثل الوينكا والايوفوريبيا مما دلل على ان لهذه الحشيشه الحامول مدي عوائلتي واسع .

ABSTRACT

This study was conducted with the aim to survey the Dodder weed in Khartoum state for five months, to identify the different hosts of this weed. The survey included many areas in the state.

This Study has proven the parasitism of Dodder on different type of hosts and ornamental plants such as (*Citrus Limon*), (*Medicago sativa*), (*Corchorus olitorius*), (*Conocarpus lancifolius*) ornamental plants such as wincka (*Catharanthus vinca*) and, (*Euphorbia Spp*). That is mean, this weed has wide range hosts.

CHAPTER ONE

Introduction

CHAPTER ONE

Introduction

Weeds are naturally strong competitors, and those weeds that can best compete always tend to dominate. (Anonymous, 1994).

Approximately 4,500 species of flowering plants (more than 1% of all angiosperms) are parasitic, obtaining some or all of their water and nutrients from other plants (Kuijt, 1969; Nickrent, 2007). A small percentage of these parasitic species infest agricultural crops and cause serious problems for farmers in many parts of the world (Parker and Riches, 1993; Musselman et al., 2001).

The genus *Cuscuta* are obligate parasitic plants with approximately 170 species distributed throughout the world (Holm *et al.*, 1997). At least four species are found in Sudan parasitizing broadleaf weeds and some crops in different parts of the country (Andrews 1954; Bebawi 1991; Abdalla and Siddig (1993). Recently Zarouget *al* (2010) reported the incidence of field dodder (*Cuscuta campestris*) parasitizing onion in the Gezira scheme in central Sudan, and causing severe losses. Dodder is a nonspecific parasite that attacks, sometimes simultaneously a wide range of host species including many cultivated plant species and dicotyledonous weeds, but not grasses or monocotyledonous weeds (Dawson *et al.*, 1994). The dodder seedling coils around the host stems and leaves, penetrates their tissue and vascular system *via* haustoria, and exploits the host by withdrawing photosynthates and water. Thus, the vigor of the host is lowered and crop production is dramatically reduced.

Dodder seeds are likely spread by man, through seed international commerce, movement of equipment, and in the mud on tires and shoes (Cudney and Lanini, 2000). The host plant of Dodder including forage legumes (alfalfa, clover, lespedeza), potato, carrot, sugar beets, chickpea, onion, cranberry, blueberry, and citrus (Dawson et al. 1994)

Parasitic Plants in Agriculture 125 Host location is a critical part of the life cycle of the most damaging parasitic weeds, which are obligate parasites that depend on the limited reserves available in seeds to quickly locate suitable hosts. Host location thus seems a promising target for control strategies.

The aim of this research to know and determine the host range and their location of parasitic plant dodder (*Cuscuta spp*) in Khartoum State .

CHAPTER TWO

Literature Review

CHAPTER TWO

LITERATURE REVIEW

2-1: General

There are over 150 species of dodders (*Cuscuta* spp.) worldwide belonging to the Convolvulaceae family. The genus *Cuscuta* (known as dodder) are obligate parasitic plants with approximately 170 species distributed throughout the world (Holm *et al.*, 1997). At least four species are found in Sudan parasitizing broadleaf weeds and some crops in different parts of the country (Andrews 1954; Bebawi 1991; Abdalla and Siddig (1993). Recently Zarouget *al* (2010) reported the incidence of field dodder (*Cuscuta Campestris*) parasitizing onion in the Gezira scheme in central Sudan, and causing severe losses. Dodder is a nonspecific parasite that attacks, sometimes simultaneously a wide range of host species including many cultivated plant species and dicotyledonous weeds, but not grasses or monocotyledonous weeds (Dawson *et al.*, 1994).

2-2: Classification of Dodder

Kingdom: Plantae

Order: Solanales

Family: Convolvulaceae

Species

Cuscuta approximata

Cuscuta californica

Cuscuta epithimum

Cuscuta europaea

(Davidson, Tish; Fry, Rebecca (2005) .

2-3:Discription of Cuscuta

2-3-1: Shoot

Cuscuta spp. have yellowto-orange, rootless, leafless vines that attach to the shoots of host plants They are obligate holoparasites, typically exhibiting broad host ranges, and inflict serious damage to many crops(Dawson et al. 1994).including forage legumes (alfalfa, clover, lespedeza), potato, carrot, sugar beets, chickpea, onion, cranberry, blueberry, and citrus (Dawson et al. 1994). Seeds of *Cuscuta*spp.have been transported worldwide in contaminated shipments of crop plant seeds. *Cuscutapentagonais* a major weed of tomatoes in California, causing yield losses

The seeds of *Cuscuta* have rough coats and vary in size, depending on the species, and may be able to survive over 20 years in the soil(DiTomaso and Healey, 2007.)

2-3-2:Flowers

The white or cream bell-shaped flowers have 3–5 petals (usually 5), are 3–4 mm in diameter and form in 2.3.3 Fruit

Fruits are globular capsules 3–4 mm in diameter containing up to 4 seeds.

2-3-3:Seeds

Seeds are brown, yellow or grey and 1–2 mm in diameter. The seeds are slightly pear-shaped and similar in size to clover and Lucerne seed

2-4: Host range

This insertion shows only limited growth. The another common character was observed that the *Cuscuta* penetration has been affected the steam of cortex tissue and this tissue elongated towards the *Cuscuta* there for stem of host plants became completely changed its structure. In *Cuscutahaustoria* apical meristem and root caps are absent and its

develops from cortical parenchyma cells of the pericycle. In addition, during the formation of the haustoria, it is also clear that cell elongation dominates over the cell division therefore the number of cells of the parasite entophytic system in the host is determined by the number of *Cuscuta* cortical parenchyma cells undergoing transformation. Furthermore, the haustoria have limited growth capacity. The anatomical studies of *Cuscuta* made by Ihl & Wiese (2000). Haustoria formation was restricted to a sub apical region (area where the most intensive elongation of the stem) of *C. reflexa* stem. According to Arnaud *et al.* (1998) while the *Cuscuta* easily attached itself to its hosts, the first difficulty was to establish connection between xylem vessels and sieve-tubes. As per the studies of Dey & Kandpati (1998), transverse sections of the affected area of the stem of *Digitaria ciliaris* showed that the haustoria penetrate the host by rupturing the bulliform cells or epidermal pores. including forage legumes (alfalfa, clover, lespedeza), potato, carrot, sugar beets, chickpea, onion, cranberry, blueberry, and citrus (Dawson *et al.* 1994)

2-5: Species of *Cuscuta*:

Dodders (*Cuscuta* spp. Family: Cuscutaceae) are distributed worldwide (Holm, L., Doll, J., Holm, E., Pancho, J. and Herberger, J. (1979) World Weeds :). They have very low host specificity and attack many plants simultaneously. Although dicotyledons are preferred as hosts, attacks on monocotyledons have been reported by (Gworgwor, N.A., Ndahi, W.B. and Chr. Weber, H. (2001). *Cuscuta campestris* is a parasitic annual plant that infests many food crops; ornamental native plants and weeds. The impact of *Cuscuta campestris* ranges from moderate to severe reductions in growth of the host plant and in some instances may result in complete loss of vigor and death as reported by (Jayasinghe, C. (2002). and also dodder weakens alfalfa, reduces its stand and can reduce yield of forage

seed production by more than 50% Germination is generally low and poor in annual holoparasites such as *Cuscuta*. Germination increases by scarification of seeds of many *Cuscuta* species (Baskin, C.C. (2008). soaked the seeds in concentrated H₂SO₄; while (Tingey, D.C. and Allred, K.R. (1961) scarified the seeds with sand paper. *Cuscuta campestris* germination characteristics are not adequately reported in Nigeria, especially in Adamawa State. With the incidence of the wide spread of *C. campestris* in the Northeast region and in Adamawa State in particular, it has become imperative to undertake a study on its biology. Therefore, this study was aimed at investigating the effect of chemical and mechanical means of breaking seed dormancy of *C. campestris*.

2-6: parasitism of Dodder

Dodders are obligate parasitic plants consisting of yellow twining stems that produce small clusters of white flowers (International: Oxon, UK, 1993).. The stems will wrap around the host and insert specialized structures (haustoria) into the vascular system of the host and become a strong sink for photosynthates. Although several species of dodder are considered to be pests in certain agricultural contexts.

Parasitism is a type of symbiotic relationship in which one organism obtains nutrients directly from a host organism. This has a detrimental effect on the host, but benefits the parasite. Although parasitic plants are commonly known to lack chlorophyll, some species have green organs, making them partially photoautotrophic. The physical link between the parasite and the host is called a “haustorium,” and often occurs through xylem-to-xylem attachment. The host can vary, ranging from the mycorrhizae of trees, to grasses and hardwood trees. The parasite often maintains open or partially open stomata, allowing transpiration to aid in extracting nutrients from the host (Clark, W.D., R. Moore, & K.R. Stern 1995)

2-7: Management

Dodder management is only achieved using combined preventive, cultural, mechanical and chemical methods that aim at control of existing populations prior to seed.

Production and control of subsequent seedlings. Fields with dodder history need to be monitored frequently, and new dodder plants must be removed as soon as possible (Parker, 2006).

2-8: Control Method

Several control approaches have been investigated. Flail mowing and burning were investigated in Southern California. Flail mowing increased yield in dodder infested alfalfa by 32 percent over untreated alfalfa (Cudney et al., 1992). Burning decreased alfalfa yields, as might be expected, but the treated soil had less dodder emergence than untreated soil when soil was moved into a greenhouse, most likely due to decreased seed production. So, if the soil has an established dodder seed bank, burning may not be a good control option (especially when considering the seed, possible longevity).

2-8-1: Cultural Control

Planting non-host grass crops (e.g., corn, sorghum), winter crops (e.g., winter wheat, broccoli, legumes), and transplanted trees with bark (e.g., pecan) can be effective in managing dodder in an infested area. However, certain broadleaf weeds such as pigweeds, lambsquarters, Russian thistle and field bindweed serve as dodder host plants and will need to be controlled as part of a successful dodder management strategy. Furthermore, due to the longevity of dodder seed, once a host crop is planted again fields need to be monitored regularly, and new dodder plants must be removed immediately.

2-8-2: Mechanical Control

Dodder infestation can be decreased by hand-pulling, Burning, cutting, or close mowing of the infested plants. If growers decide to use cultivation for dodder control, Cultivation should be done prior to dodder's attachment to the host plant.

2-8-3: Chemical Control

Several post-emergence (POST) and pre-emergence (PRE) herbicides are effective for dodder control suppression. Common PRE herbicides (applied prior to dodder emergence) for dodder control include Kerb (pronamide), Treflan (trifluralin), and Prowl (pendimethalin). POST application (applied after dodder emergence) of Dacthal (DCPA), Scythe (pelargonic acid), Raptor (imazamox), Pursuit (imazethapyr), and Gramoxone (paraquat) have been shown to be effective in dodder control/suppression. Broadcast or selective (spot treatment) application of Roundup (Glyphosate) also has been shown to provide good control of dodder; however, spot treatments of Roundup will result in crop injury in non-Roundup Ready crops.

2-8-4: Legislation

Throughout NSW all *Cuscuta* species except the native species *C. australis*, *C. tasmanica* and *C. victoriana* are Class 5 noxious weeds under the *NSW Noxious Weeds Act 1993*. These plants must not be sold anywhere within NSW. This declaration includes golden dodder (*C. campestris*) but golden dodder is also a Class 4 noxious weed in many areas of NSW. Class 4 control requirements are that 'the growth and spread of the plant must be controlled according to the measures specified in a management plan published by the Local Control Authority'. The responsibility for the control of noxious weeds on private land rests with the land owner or occupier of the land. This responsibility extends to the

middle line of any adjacent watercourse, river or inland water (tidal or non-

2-8-5: Prevention

Preventive management includes planting dodder-free cropseeds, cleaning agricultural machinery before moving from an infested area to a non-infested area, and managing existing populations prior to seed production so as to not spread dodder seeds. While small infestations can be removed by hand to prevent the production of the seed, the recommendation for controlling extensive infestations is to remove the host plant and, if possible, replant with on-host crops.

CHAPTER THREE

Materials and Methods

CHAPTER THREE

MATERIALS AND METHODS

The study was conducted in Khartoum state (Khartoum-Omdurman-Khartoum North Bahri) to collect and identify *Cuscuta* host range in the state. The all collected host range sample were recorded and filmed.

Survey sites

Khartoum site:

Samples were collected and recorded from Bisyanos factory in 7/8/2017 we found *Cuscuta* parasitic on Damas plant.

Khartoum North Bahri site:

Sample s collected from demonstration farm, College of Agricultural Studies Sudan University of Science &Technology in12/5 /2017. Also in farm in Alhalfaya near the river and beside streat the cuscuta were found parasitic on some crops in 18/7/2017 .In Shambat near the river 3/11/2017 also were found dodder parasitic in some plants.

Omdurman site:

West Libya market, project taglawi west local AL Salam Box (15) in 8/8/2017 we found it parasitic on some crops.

CHAPTER FOUR

Results and Discussion

CHAPTER FOUR

RESULTS AND DISCUSSION

The study was conducted in Khartoum state (Khartoum-Omdurman-Khartoum North Bahri) to collect and identify *Cuscuta* host range in the state. The all collected host range sample were recorded and filmed.

Here the results of the survey sites:

Khartoum site

In Khartoum site *Cuscuta* was found parasitic on Damas (*Conocarpuslancifolius*) plant that belong to family: Combretaceae



Plate 1: The *Cuscuta* parasitic on *Conocarpuslancifolius*

Khartoum North Bahri site:

In demonstration farm, College of Agricultural Studies Sudan University of Science and Technology the host of dodder was found alfalfa (*Medicago sativa*, family:Fabaceae). And *Euphorbia SPP* in Alhalfaya area the dodder parasitic on jaws (mallow *Corchorus olitorius*)(plate 2,3 and 4)



Plate 2: The Cuscuta parasitic on *Medicago sativa*



Plate3: The *Cuscuta* parasitic on *Corchorus solitorius*



Plate4:The *Cuscuta* parasitic on *Euphorbia Spp.*

Omdurman site:

The hosts of dodder in omdurman were Found (*Citrus Limón*, Family: Rutaceae) and (*Catharanthusvinca*) Family: Apocynaceae (plate 5, 6).



Plate 5: The *Cuscuta* parasitic on *Citrus Limon*



Plate 6: The *Cuscuta* parasitic on *Catharanthus vinca*

All the results obtained of the study, that the dodder is parasitic on A very wide variety of plants, including a number of agricultural and horticultural crop species such as alfalfa, lemon, jaws mallow, Damaswinca, euphorbia this finding is agree with Dawson. *et al*; (1994) ,he reported that dodder is anonspecific parasite that attacks, sometimes simultaneously wide range of host species and dicotyledonous weeds, but not grasses or monocotyledonus weeds.

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