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Research Article

A Rapid Assessment of the Invasive Dodder Weed, *Cuscuta* Spp. on Robusta Coffee, *Coffea robusta* in Busoga Coffee Growing Sub-Region, Eastern Uganda

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Abstract: Despite the importance of coffee to the national economy and livelihood of Ugandans, its yields remain low due to a number of constraints, with pests and diseases being paramount. The recent outbreak of dodder weed, *Cuscuta* spp. is threatening the coffee sub-sector, particularly in Busoga sub-region. A rapid assessment was therefore conducted in the Busoga sub-region to determine farmers' knowledge as well as status, distribution and damage of dodder weed on coffee and other plant species. Our results showed that all the respondents had knowledge of *Cuscuta* spp. However, only 57.1% of them had observed the weed on coffee and only recently - between 2019 and 2020 (50%). At plot level, dodder was observed in all the surveyed districts. On average, dodder was recorded on 40% and 10.4% of the coffee gardens and trees sampled respectively. It was also observed on 33 other plant species, with highest scores being recorded on: - *M. lutea* (18.6%), *T. peruviana* (15.7%) and *D. erecta* (8.6%). Respondents mentioned that dodder was mostly dispersed by humans – children (40%) and herbalists (5.1%). Further, 28 alternative hosts of dodder were mentioned by the respondents, with *Thevetia peruviana* (64%), *Mangifera indica* (40%), *Duranta erecta* (24%) as well as *Artocarpus heterophyllus* and *Markhamia lutea* (14%) being most outstanding. Few of the respondents had knowledge of the use of dodder – witchcraft (24.3%) and herbal medicine (5.7%). Most (81%) of the respondents were managing dodder by physically removing it. This study therefore provides baseline information for developing sustainable management strategies for dodder in coffee agro-systems.

Keywords: *Cuscuta*-spp., damage, dodder-weed, *Duranta-erecta*, farmers'-knowledge, *Markhamia-lutea*, Robusta-coffee, *Thevetia-peruviana*.

INTRODUCTION

Coffee is a priority cash crop in Uganda, playing a major role in providing annual foreign exchange [1, 2]. For example, coffee exports for the 12 months (November 2019-October 2020) amounted to 5.41 million 60-kilo bags worth US$ 513.99 million [3]. The crop is grown on about 353,907 hectares by an estimated 1.7 million smallholder farmers (a quarter of them being females), 90% of them owning gardens ranging between 0.5 and 2.5 hectares in size [1, 4]. It is estimated that about 9 million people derive their livelihood from coffee-related activities along the value chain [1]. Additionally, the crop also contributes to food security since farmers use the proceeds from its sales to cater for their daily needs (e.g. medical care, education and house improvement, among others) instead of selling their food crops [5]. Also, being perennial and due to its morphological and floristic structures [6], coffee plays important ecological roles, such as reducing atmospheric carbon dioxide (carbon sequestration [7] and conserving useful fauna like decomposers, pollinators and natural enemies [8], among others. It is, therefore, a key crop in eradicating extreme poverty and hunger, and adaptation to climate change – the 1st, 2nd and 13th Sustainable Development Goals (SDG's) respectively (www.sustainabledevelopment.un.org).

Despite the importance of this crop to the smallholder farmers and the national economy, its yield and production remain low [9]. The average 0.55 and

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0.31 kg/tree/year of actual clean (green beans) of Robusta and Arabica coffee respectively compared to potential yields of about 2 kg/tree/year for both types [10] or in other coffee producing countries like Brazil (1.4 kg/tree/year) and Vietnam (2.4 kg/tree/year) [11]. This low productivity has been attributed to a number of constraints with pests and diseases being paramount. For example, the Coffee Wilt Disease (CWD) was responsible for wiping out almost half of the Robusta coffee population in Uganda in the 1990's and early 2000's [12, 13]. This caused a loss of 1.2 million bags, translating to a loss of US$ 100 million, undermining Government efforts to increase coffee production from 3.15 to 12 million 60 kg bags by 2007/8 [14]. On the other hand, the Black Coffee Twig Borer (BCTB) is currently the most important insect pest causing an estimated loss of 9.6% that translates into an export loss of US$42.9 million [15].

The pest problem on coffee in Uganda is currently being aggravated by the recent outbreak of the dodder weed, *Cuscuta* spp. particularly in the Busoga coffee growing sub-region located in eastern Uganda where locals call it 'Nambula kifo' (lusoga dialect). However, generally, *Cuscuta* spp. is not new in Uganda; it has been existing on a number of crop species [16-19] but with limited threat to crop production. Nevertheless, the weed has been reported to infest coffee in other countries such as Guatemala [20, 21] and Mexico [22, 23]. Dodder weed attack on coffee being relatively recently in Uganda [18], there is limited information on its biology, ecology and farmers' knowledge. This information is a prerequisite for developing sustainable management strategies for *Cuscuta* spp. in coffee agrosystems as well as making decision for rational management practices for the weed.

A rapid assessment study was therefore conducted in the Busoga coffee growing sub-region of Uganda to specifically: - i) assess farmers' knowledge of *Cuscuta* spp., ii) determine the status and distribution of *Cuscuta* spp. on Robusta coffee, *Coffea robusta*, and, iii) search for other alternative plant hosts for *Cuscuta* spp. in the sub-region.

MATERIALS AND METHODS

Description of the study area

The rapid assessment study was conducted in the Busoga coffee growing sub-region that is situated in eastern Uganda, north of the equator at latitude 00° 45' 00" N and longitude 33° 30' 00" E (Fig. 1). It is located at an elevation of 1,148 meters above sea level (a.s.l). The area has a mean annual temperature of 28°C and is characterized by two rain seasons (i.e. March–June and September–December) with a mean annual precipitation of 1283 mm [24]. The soils are deep, well drained to poorly drained and contain high to moderate organic matter contents. They are weakly developed over sands, gravel and boulders and mainly consist of silt, sand and clay with pH ranges of 5.0 to 7.0 [25, 26].

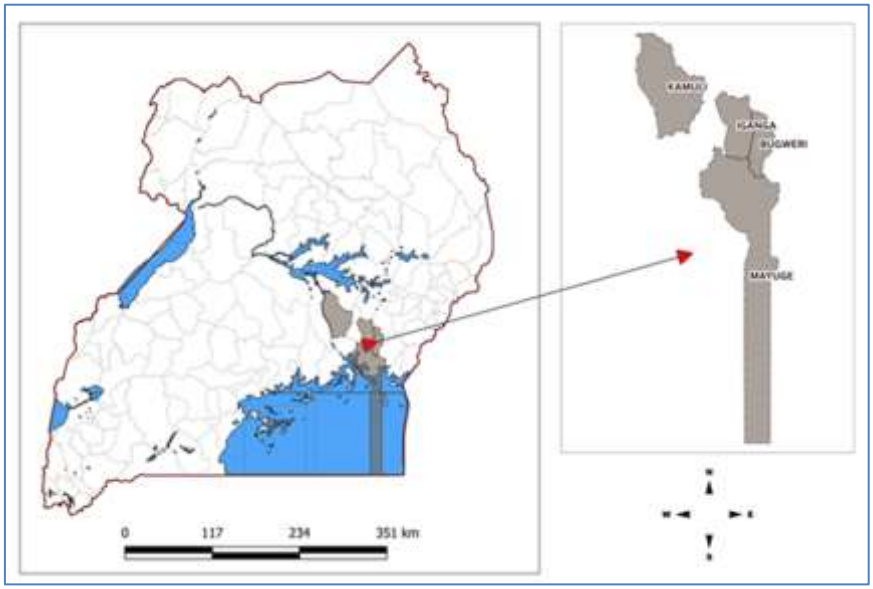

Fig-1: Map of Uganda showing the study sites

Sample selection and data collection

A multi-stage random sampling procedure was adopted in this study. Four districts namely: - Iganga, Mayuge, Bugweri and Kamuli (Fig. 1) were randomly selected in the Busoga sub-region. Two sub-counties were then randomly selected in each district and two parishes also randomly selected from each sub-county. One village was then randomly selected in each parish and 10 coffee growing households purposively selected for data collection. GPS readings of these households were recorded.

A short structured questionnaire eliciting the demographic characteristics of the households as well

as their knowledge on ecology, dispersal, uses and management of *Cuscuta* spp. was administered to the selected households. In addition, 20 coffee trees were sampled along a transect in each of the coffee gardens of the selected households. The coffee trees were scored for *Cuscuta* spp. infestation as well as the portion of the coffee plant covered by *Cuscuta* spp. Also, other alternate hosts for *Cuscuta* spp. observed on farmers' gardens were recorded.

STATISTICAL ANALYSIS

The data collected in our study were entered in Microsoft Excel spread sheet and analyzed using descriptive statistics to calculate the frequency distribution and percentage of variables. SAS v. 9.1 for Windows [35] program was used to generate the analysis.

RESULTS AND DISCUSSION

Demographic characteristics

Demographic characteristics of the interviewed farmers in Busoga coffee growing sub-region of Uganda are summarized in table 1 below. Results showed that on average more males (57.1%) than females (42.9%) were interviewed. Similarly, more males than females have been interviewed in several coffee studies conducted in Uganda [28, 29] and in other developing countries like Kenya [30], Tanzania [31] and Jamaica [32, 33]. This could be an indication that growing of coffee in developing countries is mostly dominated by males [28] and that is why the crop is usually perceived as a 'man's' crop in most of these communities [34, 35] including Uganda [36]. Nevertheless, research shows that 23-34% of the coffee growing households in Uganda and Kenya are female-headed [37, 38]. In addition, 65% of the labor force in coffee production in these communities comes from females [36].

Furthermore, the average age of the interviewed respondents in the study area was 44.1±18.0 years, with a range of 14-90 years. Our finding agrees with earlier studies by [5, 29]. This high average age means that most of the interviewed respondents were not in the youth bract, implying that participation of the youth in coffee production in Uganda is generally limited [39]. Therefore, both Government and private sector in Uganda need to create programs and initiatives that can attract the youth to engage in coffee production [5]. Younger farmers are usually more dynamic in the adoption of new farming techniques, while older ones tend to avoid technologies that demand for energy [40].

On the other hand, most (72.9%) of the respondents had attained only primary level of education, a scenario that has been reported in other coffee agro-systems of Uganda [29] and other developing counties [31, 33]. The educational level of the farmers might have a profound effect on their ability to adopt new technologies whereas the more educated farmers can easily learn and adopt new technologies [40]. This could be explained by the fact that the educated farmers easily synthesize information availed and apply them to the farming situation [41].

Table-1: Demographic characteristics of respondents interviewed in Busoga coffee growing sub-region of Uganda

Parameter		District (%)				
		Bugweri	Iganga	Kamuli	Mayuge	Mean
Sex	Males	75.0	50.0	60.0	45.0	57.1
	Females	25.0	50.0	40.0	55.0	42.9
Age (range) in years		50.9 (14-90)	46.5 (22-89)	39.6 (25-59)	37.3 (24-56)	44.1 (14-90)
Educational level	None	5.0	25.0	0.0	20.0	14.3
	Primary	90.0	70.0	60.0	65.0	72.9
	Secondary	5.0	5.0	30.0	15.0	11.4
	Tertiary	0.0	0.0	10.0	0.0	1.4

Farmers' knowledge of the bio-ecology of the dodder weed, *Cuscuta* spp

Results showed that all the interviewed respondents acknowledged that they had ever heard and/or observed dodder weed, *Cuscuta* spp. in their gardens or elsewhere. However, only 57.1% of the respondents mentioned that they had ever observed the dodder weed physically on coffee both in their coffee gardens (Table 2) and elsewhere (Table 3). This implies that *Cuscuta* spp. is not new in Uganda as it has been reported on various plant species [16-19]. In fact, this weed species is locally known as 'Nambula kifo' in this Busoga sub-region.

Nevertheless, dodder infestation on coffee in the sub-region is generally recent and this finding is supported by the fact that 50% of the respondents mentioned that they first observed the weed on their coffee between 2019 and 2020 (Table 2 and 3). *Cuscuta* spp. has been reported to attack coffee elsewhere in East Africa [18, 19] and elsewhere [20-23]. Locals in this sub-region believe that this particular species attacking their coffee originated from Western Kenya, where it has been declared an invasive species [18].

Table-2: Year when the respondents in Busoga coffee growing sub-region, Eastern Uganda first observed *Cuscuta* spp on coffee in their fields

Year first observed	District				
	Bugweri	Iganga	Kamuli	Mayuge	Overall
Not observed	40.0	40.0	90.0	25.0	42.9
2016	0.0	5.0	0.0	0.0	1.4
2018	5.0	5.0	0.0	10.0	5.7
2019	35.0	30.0	10.0	65.0	38.6
2020	20.0	20.0	0.0	0.0	11.4

Table-3: Year when the respondents in Busoga coffee growing sub-region, Eastern Uganda first observed *Cuscuta* spp on coffee elsewhere

Year first observed	District				
	Bugweri	Iganga	Kamuli	Mayuge	Overall
Not observed	20.0	15.0	0.0	0.0	10.0
2015	0.0	5.0	0.0	0.0	1.4
2016	0.0	0.0	0.0	5.0	1.4
2017	0.0	5.0	0.0	15.0	5.7
2018	20.0	25.0	10.0	25.0	21.4
2019	40.0	40.0	60.0	55.0	47.1
2020	20.0	10.0	30.0	0.0	12.9

Furthermore, more than half of the respondents were not aware of the methods of dispersal of *Cuscuta* spp. (Table 4), but, 40% of them mentioned that the weed is dispersed by children particularly, the primary school going ones. This is through direct movement of plant strands from infected hosts and placed on other susceptible hosts where it rapidly binds via haustoria and begins rapid vegetative growth [42]. Our finding is evidenced by the high weed infestations observed near primary schools in the sub-region.

It was also noted that, 7% of the respondents mentioned that the weed is transmitted by herbalists and other adult people who use it for witchcraft. Transmission of *Cuscuta* spp. by humans is one of the primary sources of infestation worldwide [43].

Table-4: Farmers' responses of the dispersal mechanism of the dodder weed, *Cuscuta* spp. in the Busoga coffee growing sub-region

District	Did not know (%)	Children (%)	Adults (%)
Bugweri	30.0	60.0	10.0
Iganga	55.0	45.0	0.0
Kamuli	50.0	30.0	20.0
Mayuge	75.0	20.0	5.0
Overall	52.9	40.0	7.1

Respondents had knowledge on the host plant range of the dodder weed. They mentioned 28 plant species, with the yellow oleander, *Thevetia peruviana* (64%), mango, *Mangifera indica* (40%), golden mound, *Duranta erecta* (24%) as well as Jackfruit *Artocarpus heterophyllus* (14.3%) and Nile tulip tree, *Markhamia lutea* (14.3%) (Table 5) being the most important hosts of *Cuscuta* spp. Farmers response agree with several authors who have reported these plant species as important plant host species of *Cuscuta* spp. For example, *T. peruviana* [44, 45], *D. erecta* [46, 47, 48], *M. indica* [49-51], *A. heterophyllus* [51] and *M. lutea* [18].

Table-5: Farmers' response of the alternative host plant species of the dodder weed, *Cuscuta* spp. in Busoga coffee growing sub-region. Highest values in bold

Scientific name	Common name	Family	Respondents (%)
Albizia coriaria		Fabaceae	1.4
Annona muricata	Soursop	Annonaceae	1.4
Artocarpus heterophyllus	Jackfruit	Moraceae	**14.3**
Azadirachta indica	Neem tree	Meliaceae	1.4
Capparis tomentosa	African caper	Capparidaceae	1.4
Citrus sinensis	Citrus	Rutaceae	10
Duranta erecta	Golden mound	Verbenaceae	**24.3**
Euphorbia tirucalli	Finger Euphorbia	Euphorbiaceae	5.7
Ficus mucuso		Moraceae	8.6
Ficus natalensis	Back-cloth Fig	Moraceae	7.1
Jatropha curcas	Pig nut	Euphorbiaceae	2.9
Lantana camara	Lantana	Verbenaceae	5.7
Mangifera indica	Mango	Anacardiaceae	**40**
Manihot esculenta	Cassava	Euphorbiaceae	5.7
Markhamia lutea	Nile tulip tree	Bignoniaceae	14.3
Milicia excels	African Teak	Moraceae	1.4
Moringa oleifera	Horseradish tree	Moringaceae	1.4
Musa spp.	Banana	Musaceae	5.7
Panicum maximum	Guinnea grass	Gramineae	4.3
Persea americana	Avocado	Lauraceae	5.7
Phaseolus vulgaris	Common bean	Fabaceae.	1.4
Pseudospondias microcarpa		Anacardiaceae	2.9
Psidium guajava	Guava	Myrtaceae	1.4
Saccharum officinarum	Sugarcane	Gramineae	1.4
Senna spectabilis	Yellow Cassia	Fabaceaea	2.9
Thevetia peruviana	Yellow oleander	Apocynaceae	**64.3**
Vitex ferruginea		Verbenaceae	4.3
Zea mays	Maize	Gramineae	1.4

Farmers' knowledge on uses of the dodder weed, *Cuscuta* spp

Majority of the respondents (73%) viewed *Cuscuta* spp. as just a weed without any other form of use (Table 5) though, 23% of them mentioned that it is used for witchcraft (Table 6). This result supports reports from various communities worldwide that associate *Cuscuta* sp. with superstitions and myths [52]. This is reflected by the various common names for the weed, such as Devil's gut, Devil's thread, Devil's hair, Devils net, witch's hair strangle weed and witch's shoelaces [52, 53].

On the other hand, a few respondents (5.7%) mentioned that herbalists use the weed as traditional medicine though the medicinal value of *Cuscuta* sp. has been recognized in a number of countries worldwide [53, 54]. This plant species is a rich in phytochemicals [53, 55] that are used for various purposes such as - as a purgative, diaphoretic, anthelmintic, diuretic, and tonic as well as in the treatment of liver disorders, cough and itching, respiratory diseases and bilious disorders [54, 55].

Table-6: Farmers' responses of the use of the dodder weed, *Cuscuta* spp. in Busoga coffee growing sub-region, Eastern Uganda

District	Did not know (%)	Witch craft (%)	Herbalists (%)
Bugweri	80.0	20.0	0.0
Iganga	85.0	10.0	5.0
Kamuli	40.0	50.0	30.0
Mayuge	70.0	30.0	0.0
Overall	72.9	24.3	5.7

Farmers' knowledge on management of the dodder weed, *Cuscuta* spp

Respondents mentioned two main methods for managing *Cuscuta* spp. in their coffee gardens – physical removal or hand removal and chemical, with the hand removal being the most important (81%; Table 7). These results agree with [56] who reported that farm workers were responsible for removing more than 90%

of the dodder weed attached on tomatoes. However, this method remains only viable when infestations are in small patches, but becomes prohibitive when infestations are extensive [42, 57, 58]. This method generally has many benefits such as increased sunlight penetration into the canopy, reduction of photosynthate loss in the host plant, and the potential to reduce the number of seeds produced by the parasite by reducing overall biomass, among others [59]. However, farmers noted that the method is very labor intensive [58] and time-consuming [43]. It might also not control dodder permanently because its haustoria can regrow from small stem fragments left behind [57], potentially negating control efforts from mechanical removal of exterior stems [58].

On the other hand, very few respondents (1.4%) mentioned that they had ever used herbicides for managing the dodder weed [60, 61]. This finding is in agreement with earlier reports of low use of herbicides in coffee agro-systems of Uganda [62, 63]. However, to effectively manage dodder, highly selective herbicides are required because its haustoria penetrate and form a closed host-parasite association [64] and such herbicides may not be readily available.

All in all, effective and economic control of the dodder weed is extremely difficult to achieve using a single strategy [58]. The key to sustainable management of dodder weed therefore requires a systematic approach that integrates the various management options, supported by understanding the complicated nature of its biology and ecology [58, 60].

Table-7: Farmers' responses of how they manage dodder weed, *Cuscuta* spp. in Busoga coffee growing sub-region, Eastern Uganda

District	Do not know (%)	Mechanical (%)	Chemical (%)
Bugweri	15.0	85.0	0.0
Iganga	25.0	75.0	0.0
Kamuli	30.0	70.0	0.0
Mayuge	5.0	90.0	5.0
Overall	17.1	81.4	1.4

Dodder weed, *Cuscuta* spp. infestation on coffee at plot level

Plot level results showed that *Cuscuta* sp. was present in all the surveyed districts in the Busoga coffee growing region of Uganda (Table 7). Dodder weed was observed on 40.0% and 10.4% of the coffee farms and trees assessed respectively – with 7.8% of the coffee trees having more than half of their canopy covered by the weed (Fig. 2; table 8). Our finding supports earlier reports of the existence of the dodder weed on various plant species in Uganda [16-19]. In this sub-region, *Cuscuta* spp. is locally known as 'Nambula kifo' (lusoga dialect), emphasizing the fact that the weed species is not new in the sub-region. Furthermore, *Cuscuta* spp. has been reported to infest coffee in East Africa [18, 19] and beyond [20-23]. Locals in this sub-region believe that this particular species attacking their coffee originated from Western Kenya, where it has been already declared an invasive species threatening crop production [18].

The fact that the infested plant host eventually dries and dies [20], implies that the invasion of *Cuscuta* spp. is likely to cause a yield loss of 10.4% of the coffee in the Busoga sub-region, if it is not controlled. Similarly, the weed has been reported to cause varying yield losses in other crop species such as: - 37-40% in sugar beets [65, 66], 47% in cassava [67], 75% in tomatoes [56], 70-90% in carrots [68] and 80% to 100% in cranberry [69], among others.

Table-8: Dodder weed, *Cuscuta* spp. infestation observed on coffee farms and trees in Busoga coffee sub-region, Eastern Uganda

District	Infested coffee farms (%)	Infested coffee trees (%)	Proportion of coffee tree covered		
			≤30%	30-50%	>50%
Bugweri	50.0	13.3	0.0	1.8	11.5
Iganga	35.0	10.3	1.5	0.8	7.9
Kamuli	20.0	3.0	1.0	0.5	1.5
Mayuge	45.0	11.5	2.3	2.0	7.3
Regional mean	40.0	10.4	1.2	1.4	7.8

Fig-2: Robusta coffee, *Coffea robusta* garden highly infested by the dodder weed, *Cuscuta* spp. in Busoga coffee growing sub-region, Eastern Uganda

Dodder weed, *Cuscuta* spp. infestation on alternative plant hosts at plot level

Cuscuta spp. are widely distributed across the world, and reported to colonize a wide range of hosts across various habitats [57]. The search for alternative host species of dodder weed in Busoga coffee growing sub-region yielded 33 alternative plant hosts belonging to 20 plant families (Table 8). The number of species and families recorded in our study falls within the range of other related host range studies for *Cuscuta* sp. in other African countries [70] and elsewhere [48, 51]. The plant families observed with the most susceptible plant taxa were: - Moraceae (5 species), Fabaceae (4 species) and Euphorbiaceae (3 species) (Fig. 3; Table 8). This finding is in agreement with reports by [48, 51, 70].

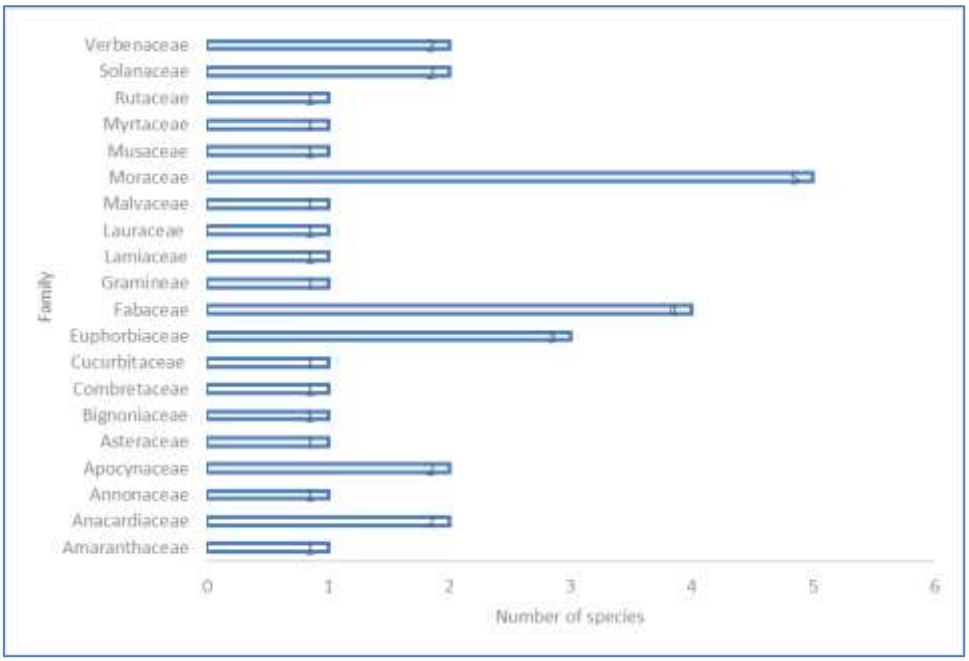

Fig-3: Plant families infested by the dodder weed, *Cuscuta* spp. in the Busoga sub-region coffee growing systems of Eastern Uganda

Table 9 further show that the highest number of plant species infested by *Cuscuta* spp. observed in the coffee gardens were: - Nile tulip tree, *M. lutea* (Benth.) K. Schum. (18.6%), yellow oleander, *T. peruviana* (15.7%) and golden mound, *D. erecta* (8.6%). In fact, these were among the plant species that were most frequently mentioned as alternative host plant species of dodder by the respondents in this study (Table 5). Similarly, these plant species have been reported to be good hosts of the dodder weed by other researchers [44-48].

Incidentally, *M. lutea* is one of the most common and abundant shade tree species in the coffee agroforestry systems in Uganda [71, 72] whereas *T. peruviana* and *D. erecta* are common ornamentals in a number of households [73]. Ornamentals have been reported to be amongst common hosts of dodder weed,

though, it rarely destroys them totally but the weakness caused by parasitism creates threats from other harmful organisms, primarily insects and various pathogens [60].

Table-9: Percentage of alternative plant host species of the dodder weed, *Cuscuta* spp. recorded in Busoga coffee growing sub-region, Eastern Uganda. Highest values in bold

Scientific name	Common name	Family	Group	Percent
Acacia hockii	White thorn Acacia	Fabaceae	Dicot	1.4
Albizia coriaria		Fabaceae	Dicot	1.4
Alstonia boonei	Pattern wood	Apocynaceae	Dicot	1.4
Amaranthus spp.	Amaranth spinach	Amaranthaceae	Dicot	1.4
Annona muricata	Soursop	Annonaceae	Dicot	1.4
Citrus sinensis	Citrus	Rutaceae	Dicot	5.7
Duranta erecta	Golden mound	Verbenaceae	Dicot	**8.6**
Euphorbia tirucalli	Finger Euphorbia	Euphorbiaceae	Dicot	2.9
Ficus exasperate	Sandpaper tree	Moraceae	Dicot	1.4
Ficus mucuso		Moraceae	Dicot	1.4
Ficus natalensis	Back-cloth Fig	Moraceae	Dicot	4.3
Ficus spp.		Moraceae	Dicot	1.4
Gliricidia sepium	Mexican lilac	Fabaceae	Dicot	1.4
Jatropha curcas	Pig nut	Euphorbiaceae	Dicot	4.0
Lantana camara	Lantana	Verbenaceae	Dicot	4.3
Luffa aegyptiaca	Sponge gourd	Cucurbitaceae	Dicot	1.4
Mangifera indica	Mango	Anacardiaceae	Dicot	1.4
Manihot esculenta	Cassava	Euphorbiaceae	Dicot	1.4
Markhamia lutea	Nile tulip tree	Bignoniaceae	Dicot	**18.6**
Milicia excelsa	African Teak	Moraceae	Dicot	1.4
Musa spp.	Banana	Musaceae	Monocot	1.4
Ocimum gratissimum	African basil	Lamiaceae	Dicot	1.4
Panicum maximum	Guinea grass	Gramineae	Monocot	1.4
Persea americana	Avocado	Lauraceae	Dicot	1.4
Pseudospondias microcarpa	African Grape Tree	Anacardiaceae	Dicot	1.4
Senna spectabilis	Yellow Cassia	Fabaceae	Dicot	4.3
Solanum gilo	African eggplant	Solanaceae	Dicot	1.4
Solanum incanum	Sodom apple	Solanaceae	Dicot	1.4
Syzygium cumini	Java plum	Myrtaceae	Dicot	1.4
Terminalia mantaly	Umbralla tree	Combretaceae	Dicot	1.4
Thevetia peruviana	Yellow oleander	Apocynaceae	Dicot	**15.7**
Urena lobata	Ceasar weed	Malvaceae	Dicot	1.4
Vernonia amygdalina	Bitter leaf	Asteraceae	Dicot	1.4

Fig-3: Plant species with the highest *Cuscuta* spp. infestation observed in Busoga coffee growing sub-region, Eastern Uganda – (a) Nile tulip tree, *Markhamia lutea*, (b) yellow oleander, *Thevetia peruviana*, and (c) golden mound, *Duranta erecta*

Results further showed that 93.9% of the alternative plant species infested by *Cuscuta* spp. were dicotyledonous (Fig. 4). However, a few monocots - Guinea grass, *Panicum maximum* and bananas, *Musa* spp. were also observed with *Cuscuta* spp. damage (Table 8), as reported by [58, 74]. The fact that *Cuscuta* spp. prefers dicots and rarely attacks monocots has also been reported by [43, 75]. This is probably because of barriers formed by anatomical positions such as the arrangement of vascular bundles or incompatibility of signals that are important for forming interspecies connections of vascular strands or by direct defense response applied by the monocot host [43].

The presence of these alternative hosts of the dodder weed in the coffee agro-systems presents management complications for the weed as farmers have to choose protecting their coffee from the weed by eliminating the most susceptible plant host species or maintaining them for various purposes.

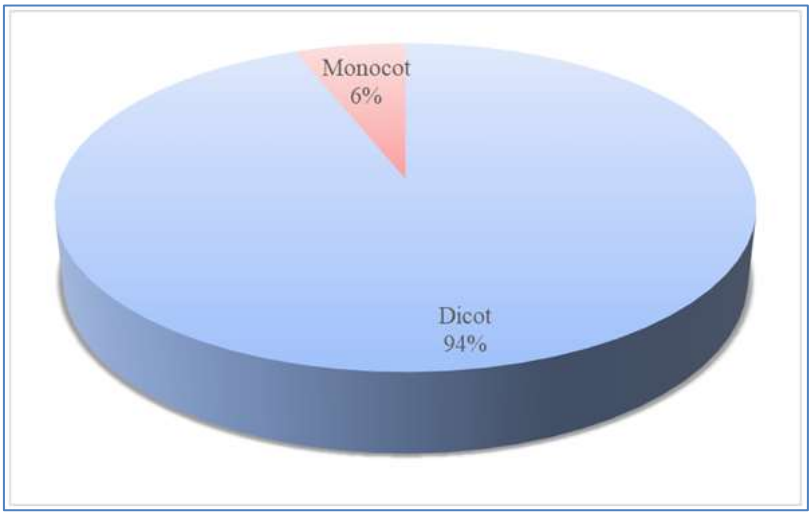

Fig-4: Classes of the alternative plant host species of Cuscuta spp. observed in the Busoga coffee growing sub-region, eastern Uganda

CONCLUSION

Our study aimed at determining farmers' knowledge as well as status and distribution of *Cuscuta* spp. on Robusta coffee, *C. robusta* and other alternative plant hosts species in Busoga coffee growing sub-region. Results showed that all the interviewed respondents had knowledge of and had observed the dodder weed either in their gardens or elsewhere. *Cuscuta* spp. was observed in all the sampled districts, with 40 and 10.4% of the coffee gardens and trees infested respectively. This implies that the weed is becoming a major threat to coffee production in the sub-region, if no control measures are quickly put in place. There is therefore urgent need to sensitize farmers on the damage and management of dodder weed so as to limit further spread. Research needs therefore to quickly develop and promote sustainable management strategies for dodder in coffee agro-systems.

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