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Studies on Biological Control of *Cuscuta chinensis* Lamk–A Parasitic Weed by *Euphorbia hirta* L.

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Cuscuta chinensis is commonly called as China dodder, a flowering parasitic weed that infests many crops. Because it is a parasite, it cannot survive alone. It is a serious problem in forage legumes, tomatoes, ornamental plants and several other herbaceous plants. It tremendously reduces the yield and quality of crop. As an indication of seriousness, dodder is the only weed that is legally restricted as a contaminant in crop seed in each of the contiguous 48 states of USA. Therefore, every effort to prevent dodder from establishing itself has been given top most priority. Dodder is reproduced by seed. *Cuscuta* seeds are heavy and are not adapted to dispersal by wind or water and are not attractive to animals that could carry them from one place to another. The parasite can be introduced to previously clean fields by planting crop seed contaminated with dodder seed. Dodder can also be spread from one farm to another by tillage. Manure or mud containing seeds may adhere to farm equipments, animals or human beings and thus be carried from one place to another. If hay containing dodder seed is fed to livestock the weed may be spread because dodder seed can pass through the digestive track of animals and still germinate. Uncontrolled dodder on fences and along road sides can also infest fields and irrigation water may also carry dodder seed from field to field.

Dodder commonly appears first on farm as scattered patches. At present there is no satisfactory method for destroying attached dodder selectively. To control such patches of dodder, both the parasite and the host plant on which it is growing need to be destroyed. This method is used when the infestation of the dodder is small enough that the resultant loss of the crop does not exceed the price of controlling the dodder. Scattered infestations can be controlled by cutting, burning, by flaming or by applying contact herbicide in an integrated manner. Dodder is very difficult to control selectively, once it has become attached to a host plant. Therefore, herbicides applied to the soil that kill the dodder seedling before they become attached to a host plant are more effective. The chemicals which have been most effectively used to control dodder are chloropropham, DCPA[1] , Pronamide, CDEC[2] and dichlobenil. But all these herbicides are not environment friendly, some of these are not federally registered under the Environment Protection Act. In view of this, biological control of dodder is considered to be the best, which does not cause any environmental pollution. The effect of clusterbean for the management of china dodder was studied by Rao and Reddy (1987). Bioinhibitory activity of *Quisqualis indica*, *Rumex hastatus*, *Parthenium hysterphorus* and *Tagetus petula* has been studied by Raju (2001). In line with these investigations, a study on intergeneric competitions among *Phaseolus aureus* L. (greengram), *Euphorbia hirta* and *Cuscuta chinensis* Lamk (China dodder) was planned.

The experiment was conducted in Gannavaram, Krishna district, A. P. India, in red soils during November and December, 2006. The experimental area was thoroughly ploughed and composted homogenously. The experiment was conducted in six plots (50 x 50 cm) for six sets. All the plots were irrigated at same interval.

The first set was the control, where 35 greengram plants were grown in each plot in equal distance. In the second set, 35 greengram plants were grown and infested with one dodder seedling. To develop dodder seedlings, dodder seeds were treated with concentrated sulphuric acid for 2 min, thoroughly washed and the wet seedlings were allowed to germinate in small paper pouches with soil. The *Cuscuta* infestation in required plots was done on the same date. In the third set, 35 *E. hirta* seedlings with 5 cm stem height were collected and transplanted in each plot. In the fourth set, 35 *E. hirta* seedlings were transplanted in each plot and were infested with a single *Cuscuta* seedling. In the fifth set, 35 greengram plants, 35 *E. hirta* plants, and one

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[1]DCPA not federally registered to control dodder.
[2]CDEC not federally registered to control dodder.

dodder seedling were grown and greengram plant was infested with *Cuscuta*. In the sixth set same number and type of plants as in fifth set, but *E. hirta* plant was infested with *Cuscuta*. After 60 days, different plants and their parts were separately collected from separate plots and the average dry weights were obtained.

On the basis of the data (Table 1) it was evident that the biomass of the greengram in the first set, where there is no infestation of the dodder, was 33.2 g/plot, when compared to other sets. But in second set where the greengram was infested with dodder a drastic decrease in the biomass to 14.16 g/plot was observed. At the same time the China dodder was well established with dry weight of 5.2 g and spread over all the plants in that plot. In the third and fourth sets, there was no decrease in the biomass of *E. hirta*; however, the *C. chinensis* which infested *E. hirta* was unable to spread on to the other plants and its dry weight was restricted to 0.125 g/plot. As the dodder punctured the *E. hirta* stem on coming in contact with latex started to shrivel. In the fifth and sixth sets which included greengram, *E. hirta* and *Cuscuta*, it was evident that when *Cuscuta* infested greengram the spread of dodder was not as prominent as in pure cultures of greengram. In the other case where the dodder infested *E. hirta*, due to poor establishment the spread of *Cuscuta* was restricted and its dry weight was only 0.150 g/plot.

Table 1. Biomass accumulated by *Cuscuta chinensis* after infestation on *Phaseolus aureus, Euphorbia hirta* alone or when grown together in the same plot

S. No.	Name of the plants grown in a plot	No. of plants in a plot	*Cuscuta* infestation on	Dry weight of root (g/plot)	Dry weight of stem (g/plot)	Dry weight of leaves (g/plot)	Dry weight of reproductive organs (g/plot)	Total dry weight of plants in a plot (g/plot)
1.	*Phaseolus aureus*	35	Nil	3.515	7.000	9.841	12.933	33.289
2.	*Phaseolus aureus*	35		1.942	3.496	5.910	2.807	14.155
	Cuscuta	1	*Phaseolus aureus*	-	1.605	-	3.595	5.200
3.	*E. hirta*	35		1.225	4.341	6.163	1.15	12.879
4.	*E. hirta*	35		1.116	4.208	6.185	1.100	12.609
	Cuscuta	1	*E. hirta*	-	0.125	-	-	0.125
5.	*Phaseolus aureus*	35		3.000	5.880	7.110	9.031	25.021
	E. hirta	35		1.120	4.276	5.686	1.140	12.222
	Cuscuta	1	*Phaseolus aureus*	-	0.375	-	0.305	0.680
6.	*Phaseolus aureus*	35		3.103	5.941	8.125	10.141	27.195
	E. hirta	35		1.050	4.216	5.926	1.003	12.195
	Cuscuta	1	*E. hirta*	-	0.150	-	-	0.150

The above investigation shows that *E. hirta* plants, when they are at 5 cm or more in height, can act as trap plants to decrease the seed bank of *C. chinensis* present in the soil. The slight decrease in the biomass of greengram, when they are mixed with *E. hirta*, is due to the increase in density and intergeneric competition. If the *E. hirta* plants are grown in fields where China dodder was prevalent, the vigorous spreading of the *Cuscuta* can be checked. Thus, yield could improve without any usage of herbicides which might damage the environment.

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