# STUDIES ON DODDER (*CUSCUTA SPP.*) INFESTATION IN CLOVER (*TRIFOLIUM ALEXANDRINUM* L.) FIELDS IN SOME GOVERNORATES IN NILE DELTA

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***Abstract***

Set of field, laboratory and farmer questionnaire studies were conducted in three governorates in the Nile Delta i.e. Menoufia, Kafr El-Sheikh and Gharbia in the period from 2000/2001 to 2004/2005 winter seasons to throw light on the magnitude of dodder problem in Egyptian clover and provide information on dodder infestation level and measures for its control.

Field surveillance study in 260 clover fields in Menoufia governorate shows that 11.1% of surveyed fields were infested with dodder from *Cuscuta planiflora / pedicellata* mixture appeared as scattered patches ranged from 0.25 to 22 $m^2$ in its size. Severity (%) or covered area by dodder represents 0.52% of total surveyed area in clover fields over governorate. Results of seed contamination from 150 farmer seed samples were inspected in laboratory exerted that 87% of them were contaminated with dodder seeds with average 14.4 g / kg of clover seeds. Samples collected from certified seeds were free of dodder seeds. These results indicate that clover seeds represent the main source of dodder infestation.

Germination study showed that optimum temperature for dodder seed germination was 15 °C and it can germinate in range of 10-20 °C.

Results of questionnaire study for 100 farmers, on their awareness by dodder problem and available measures for controlling it, indicated that 85% of farmers suffer from dodder problem, 5% use certified or cleaned seeds and 20% of them have high infestation levels in scattered patches. The available practice for 50% of the farmers to control dodder is through mowing or hand pulling. It was shown that 68% of farmers need an effective package to compact this problem.

## INTRODUCTION

Dodder species (*Cuscuta* spp.) are distributed worldwide and attack many different host plants. International trade, mainly with contaminated crop seeds, has led to the wide distribution of this parasite. Dodder *Cuscuta planiflora* Ten, is known to be the main pest attacking the Egyptian clover, *Trifolium alexandrinum.* (Tackholem, 1965). *Cuscuta planiflora* Ten., *C. pedicellata Ledeb.* and *C. epythimum* (L.) Murr. occurring mainly on forage legumes in the Mediterranean area (Malcolm and Graves, 1995 and Bolous, 2000).

There is no good statistics on the extent of infestations by *Cuscuta* species. Stojanovic and Mijatovic (1973) revealed that over 80% of Lucerne and red clover fields were infested by *C. campestris* in Yugoslavia and 20% of these crops were abandoned. In Egypt, dodder is a serious problem in some field of forage and vegetable crops, fruit trees and ornamental plants (Al-Menoufi *et al.*, 1983). Dodder (*Cuscuta spp.*) is an obligate stem and leaf parasite of legumes and other broadleaf species (Dawson and Saghir, 1983). Great yield losses in yield of dodder hosts are attributed to its parasitism. Al-Shair, (1986) mentioned that *Cuscuta planiflora* decreased *Trifolium alexandrinum* fresh weight and dry weight at the first and second cuts, the number of seeds per inflorescence, seed yield and germination percentage and increased seed number. Relatively few crop loss studies have been published, but Dawson (1989) arrived at a figure of 57% reduction in forage yield of lucerne over a 2-year period from artificial infestations of *C. campestris*. There is little doubt that yield loss can be almost total and *Cuscuta* itself can prove mildly toxic as infested forage may need to be destroyed altogether as reported by Malcolm and Graves (1995). Dodder infestation by 577 and 688 g/m$^2$ reduced clover yield by 11.12 and 10.90 t/ha for second and third cutting, respectively compared to non-infested plots (Abd El-Hamid and Shebl, 2002).

*Cuscuta* spp. are normally annual weeds, with seed of 1 mm, gray-brown color, with similar aspect and size to the alfalfa and clover seeds. Germination occurs without stimulant when temperature (10–25 °C) and moisture conditions are favorable. Hutchison and Ashton (1980) stated that the time for dodder germination was correlated with temperature. The optimal temperature for seed germination range from 20 to 32 °C according to the species. Germination and growth of dodder were found to be effected by temperature. Full sunlight and temperature above 30 °C favour the growth of dodder. When soil humidity is adequate, dodder seedlings emerge at a wide range of temperatures, from 18 to 37 °C, with optimum temperature around 30 °C. Assad *et al* (1982) revealed that dodder seeds can germinate over a wide range of temperatures, but the optimum temperature for seed germination as well as seedling growth is above 18 °C average daily temperature.

Concerning integrated control of *Cuscuta*, researches revealed that a feasible, economical unique and universal mean of *Cuscuta spp.* control in any crop is not known yet, so that the feasibility of *Cuscuta* control methods has to be examined for each *Cuscuta* species vs. crop situation. Avoidance of *Cuscuta* seed introduction in non-infested fields is by far the most effective and economical control methods. Crop seeds cleaning is, therefore an essential part in this infestation avoidance method. Avoidance of the *Cuscuta* seed movement by any mean (host plants, irrigation or machinery) into

the un-infested field is the most important method to prevent coming infestation (Garcia Torres, 1993).

Where herbicides are not feasible, control usually depends on hand-pulling to remove the parasite before fruiting, also rotation into resistant crops such as cereals or grass (Foy *et al*, 1989; Parker and Riches, 1993). *Cuscuta* commonly appear first on a farm as scattered patches. If measures to destroy this initial infestation are not taken, an extensive widespread infestation can usually be prevented. Initial patches/spot of *Cuscuta* must be controlled, at regular interval, by any mean (cutting, firing, burning or by herbicides) to prevent further spread of the infestation. There is no satisfactory method to destroy attached *Cuscuta* plant selectively. To control such patches the crop and parasite plants has to be destroyed through cutting, firing, burning or applying total (non-selective) herbicides (Garcia Torres, 1993).

In widespread infestations, *Cuscuta* seedlings are easily control by tillage since they are rootless. Repeated tillage at certain interval is needed to reduce the infestation. The delay of the crop sowing dates in combination with tillage will decrease *Cuscuta* infestation, but rarely will eliminate it completely. Late summer or early autumn planting is advisable for winter crop, due to the poor growing of *Cuscuta* seedling with the low temperatures of the coming months. Crop rotation can play important role in dodder control, as *Cuscuta* infestation can be considerably reduced by growing non-susceptible crops, mainly grassy crops. Keeping such crops free of broadleaf weeds that would serve as a host, no *Cuscuta* seedling can grow and produce seeds (Garcia Torres, 1993).

In fields that are moderate to heavily infested by dodders (*Cuscuta spp*), the most effective control are herbicides. Several herbicidal treatments are reported for dodder control such as pronamide (Kerb 50% at 2.38 kg/ha), glyphosate (Roundup 48% at 75-150 g/ha) and butralin (Amex 48% at 5.98 L/ha) are reported as effective herbicides for dodder control in alfalfa and clover without any adverse effect on their growth (Abd El-Wahed, 1996; Zaki *et al*, 1998; Hassanein and Ibrahim, 2000; and Abd El-Hamid and Shebl, 2002).

There is no available information about the magnitude of dodder problem in Egyptian clover about its distribution or measures for their control. Therefore, the present study was conducted to monitor this problem in clover fields and farmers levels as the first step for planning the strategy of control. Monitoring was achieved through investigating size of dodder infestation in clover fields in some governorates in the Nile Delta, studying the optimum temperature for dodder germination and investigating source and percentage of contamination by dodder seeds in clover seeds and the necessity for an integrated package for dodder control in clover fields.

## MATERIALS AND METHODS

During 2000/2001 to 2004/2005 winter seasons, four studies were conducted in Kafr El-Sheikh, Gharbia and Menoufia governorates in the Nile Delta to investigate the problem of dodder infestation in clover fields as follow:

**I. Germination study**

This study was carried out during 2000/2001 season to investigate the temperature range as well as the optimum temperature for dodder seed germination under laboratory conditions. Number of 100 dodder seeds were distributed in a Petri dish 10-cm diameter and replicated four times for each tested temperature (5, 10, 15, 20, 25, and 30 °C). Filter paper and tab water were the media for dodder seed germination in the Petri dishes. Seeds were left in the growth chamber for 15 days. Finally germinated seeds were counted and germination percentage was estimated for each studied temperature. It should be noted that this experiment was repeated two times and the shown data represent the average of the two experiments. Data were subjected to statistical analysis for both original and transformed data according to Steel and Torrie (1980).

**II. Seed contamination study**

Total of 200 samples of clover seeds (50 g) were collected during 2001/2002 winter season to estimate dodder contamination percentage in clover seeds. Where, 150 samples of clover seeds were collected from farmers from El-Riad and Quellin districts in Kafr El-Sheikh governorate and from El-Mahalla and Qutour districts in Gharbia governorate, in addition to 50 clover seed samples from certified seeds were collected from the High Tech. Company. Dodder seed were separated from each sample and weighed as g per kg of clover seed. Dodder contamination percentage in clover seeds was recorded. Data were subjected to statistical analysis to estimate standard errors (SE) of means according to Steel and Torrie (1980).

**III. Questionnaire study**

During 2001/2002 winter season, questionnaire study was conducted with number of 100 farmers chosen randomly from different villages from El-Hamool, All-Riad and Quellin districts in Kafr El-Sheikh governorate. Farmers answered and discussed dodder problem in clover fields through the following aspects:

1- Source of clover seeds.

2- Date of clover planting.

3- Infestation percentage by dodder in their clover fields.

4- Severity of dodder infestation.

5- Dodder control methods adopted by farmers.

6- Effectiveness of these methods.

7- The necessity for more effective package for dodder control.

**IV. Dodder survey in clover fields in Menoufia governorate**

During 2004/2005 winter season, total of 274 clover fields belong to 28 villages from five districts (i.e. Quesna, Ashmoon, Al-Bagour, Berket El-Sabae and Shebin El-Koom) were surveyed during April and May 2005 to monitor infestation, severity and frequency percentages of dodder (*Cuscuta spp*) in clover fields in Menoufia governorate. Five samples were surveyed randomly in each of surveyed clover field. Each sample covered area of 25 $m^2$.

Covering measure was used as a base to evaluate dodder infestation level (severity) according to Daie and El-Khanagry (2004), Kershaw (1975) and Abousteit *et al*, (1993). The following parameters were used to evaluate infestation and covering (severity) percentages of dodder as follow:

$$\text{Infestation \%} = \frac{\text{Number of infested fields}}{\text{Total number of surveyed fields}} \times 100$$

$$\text{Covering (severity) \%} = \frac{\text{Dodder infested area } (m^2)}{\text{Total surveyed area } (m^2)} \times 100$$

Data were subjected to statistical analysis to estimate standard errors (SE) of means according to Steel and Torrie (1980).

## RESULTS AND DISCUSSION

**I. Germination study**

Data revealed that dodder seeds of *Cuscuta planiflorum* which dominated clover fields germinated in temperatures ranged from 10 to 20 °C and the optimum temperature for dodder germination was 15 °C, as 60% of dodder seeds germinated at 15 °C. Meanwhile, 41.7% of dodder seeds germinated at 10 °C compared with 20.6% germination recorded at 20 °C. No germination occurs at either 5 °C or at 30 °C. Assad *et al* (1982) revealed that dodder seeds can germinate over a wide range of temperatures, but the optimum temperature for seed germination as well as seedling growth is above 18 °C average daily temperature as shown in Table (1) and Figure (1).

Table 1. Effect of temperatures on germination of dodder seeds, *Cuscuta planiflora* under laboratory conditions

| Temperature °C | Germination % | |
|---|---|---|
| | Original data | Transformed data |
| 5 | 0.0 | 0.0 |
| 10 | 44.0 | 41.7 |
| 15 | 60.0 | 50.9 |
| 20 | 13.0 | 20.6 |
| 25 | 2.0 | 8.0 |
| 30 | 0.0 | 0.0 |
| LSD | | 3.23 |
| SE | | 3.71 |

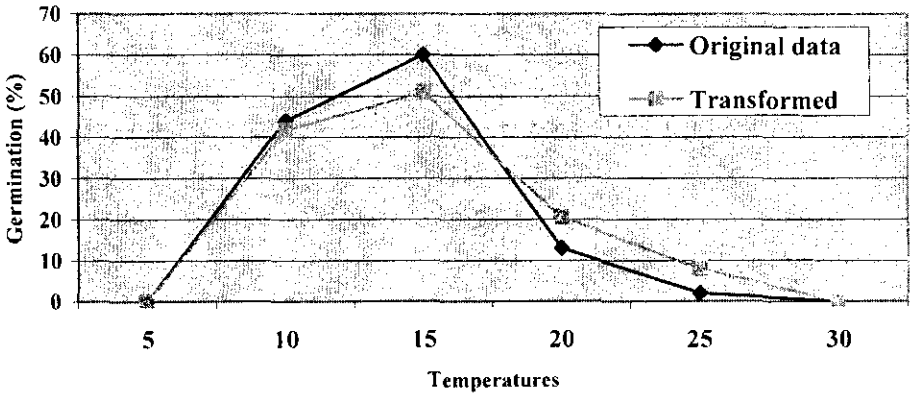


Fig. 1. Effect of temperatures on germination % of Cuscuta planiflora in clover fields under laboratory conditions

**II. Seed contamination study**

Results revealed that 86.7% of farmers' seed samples were infected by dodder seeds, average of the two governorates. Meanwhile seed samples collected from the certified seeds were free of dodder seeds. Within governorates, data revealed that seed contamination was higher in Kafr El-Sheikh (92.5%) than that recorded in Gharbia governorate (80%) as shown in Table (2).

Most of contaminated samples (62.7%) occurred in the range of (1-5), (6-10) and (11-15) g/kg of clover seeds. 12.7% of contaminated samples occurred in the range of more than 30 g/kg of clover seeds as shown in Table (3).

In Kafr El-Sheikh, 56% of contaminated samples occurred in the ranges of (1-5), (6-10) and more than 30 g/1 kg of clover seeds. Meanwhile, 70% of contaminated samples lay in the range of (1-5), (6-10) and (11-15) g/kg of clover seeds in Gharbia governorate.

Table 2. Dodder contamination % in clover seed samples and weight of dodder seeds (g/kg) clover seeds in Kafr El-Sheikh and Gharbia governorates, 2001/2002 season

| Governorates | Districts | Number of clover seed samples | Number of contaminated samples | % contaminated samples | Weight of dodder seeds in clover seeds (g/kg) Mean | SE |
|---|---|---|---|---|---|---|
| Kafr El-Sheikh | El-Riad | 45 | 40 | 89 | 11.22 | ± 2.25 |
| | Quellin | 35 | 35 | 100 | 30.99 | ± 5.79 |
| | Over destrict | 80 | 75 | 94 | 21.11 | |
| Gharbia | El-Mahalla | 30 | 28 | 93 | 9.25 | ± 1.99 |
| | Qutour | 40 | 28 | 70 | 6.23 | ± 0.88 |
| | Over destrict | 70 | 56 | 80 | 7.74 | |
| Over Governorates | | 150 | 131 | 87 | 14.42 | |

It could be concluded that most farmers' clover seed samples were contaminated by dodder seeds with ranges of 1-5, 6-10 and more than 30g/kg of clover seeds. Contamination in farmer seed samples was higher in Kafr El_Sheikh than in Gharbia governorates. These results explain the reason for the increment of dodder infestation in clover fields, because most of farmers use their clover seeds rather than certified and clean seeds for sowing their clover fields. In this concern, Garcia Torres (1993) reported that avoidance of *Cuscuta* seed introduction in non-infested fields is by far the most effective and economical control methods. Crop seeds cleaning is, therefore an essential part in this infestation avoidance method.

Table 3. Weight averages of dodder seeds in clover seed samples (g/kg) collected from farmers in Kafr Elshiekh and Gharbia, 2001/2002 season

| Weight averages of dodder seeds (g/kg) of clover seeds | Governorates: Kafr El-Sheikh | | | | El-Gharbia | | | | over governorates |
|---|---|---|---|---|---|---|---|---|---|
| | El-Riadh | Quellin | Total contaminated samples | contamination % | Al-Mahalla | Qutour | Total contaminated samples | contamination % | |
| 0 | 6 | 0 | 6 | 7.5 | 2 | 12 | 14 | 20.0 | 13.3 |
| > 1 | 1 | 0 | 1 | 1.3 | 0 | 0 | 0 | 0.0 | 0.7 |
| (1- 5) | 16 | 9 | 25 | 31.3 | 15 | 9 | 24 | 34.3 | 32.7 |
| (6-10) | 10 | 4 | 14 | 17.5 | 3 | 10 | 13 | 18.6 | 18.0 |
| (11-15) | 2 | 4 | 6 | 7.5 | 6 | 6 | 12 | 17.1 | 12.0 |
| (16-20) | 2 | 4 | 6 | 7.5 | 1 | 3 | 4 | 5.7 | 6.7 |
| (21-25) | 1 | 1 | 2 | 2.5 | 0 | 0 | 0 | 0.0 | 1.3 |
| (26-30) | 2 | 1 | 3 | 3.8 | 1 | 0 | 1 | 1.4 | 2.7 |
| <30 | 5 | 12 | 17 | 21.3 | 2 | 0 | 2 | 2.9 | 12.7 |

## III. Questionnaire study

Questionnaire study show the percentage of responded farmers to various questionnaire items related to clover infestation by dodder as well as the available dodder control methods as shown in Table (4) and Figures (2,3,4,5,6 and 7).

The questionnaire indicated that the sources of clover seeds for 55 and 40% of the farmers were from the markets and from their own seeds, respectively. Only 5% of the farmers used the certified seeds for growing clover (Fig 2).

This fact explained the reason behind the increment of dodder infestation in dodder fields in Egyptian fields, where majority of the farmers using contaminated clover seeds by dodder seeds and did not use certified seeds for growing clover. Using certified and clean seeds is the most effective methods that control dodder infestation. Dawson (1990) reported that control of dodder is chiefly affected by the use of the clean crop seeds and by employing certain chemical sprays on vegetative growth. Avoidance of *Cuscuta* seed introduction in non-infested fields is by far the most effective and economical control methods. Crop seeds cleaning is, therefore an essential part to avoid new dodder infestation.

Concerning time of clover planting, result revealed that 30 and 60% of the farmers planting clover on September and October, respectively. Meanwhile only 10% of farmers planting clover on November as show in Fig (3). The delay of the crop sowing dates in combination with tillage will decrease *Cuscuta* infestation. Late summer or early autumn planting is advisable for winter crop, due to the poor growing of *Cuscuta* seedlings with the low temperatures of the coming months. Furthermore, if the autumn sown crop has developed a consistent canopy during the winter, it will prevent the attachment of *Cuscuta* seedlings, due to the shading effect (Garcia Torres, 1993).

Table 4. Questionnaire study for dodder infection in clover fields in Kafr El-Sheikh governorate during 2001/2002 season

| Questionnaire items | Variables % | | | |
|---|---|---|---|---|
| Source of clover seeds | Market<br>55 | Certified seeds<br>5 | Farmer seeds<br>40 | |
| Time of planting clover | September<br>30 | October<br>60 | November<br>10 | |
| Infestation | Infested<br>85 | Non-infested<br>15 | | |
| Severity of infestation | No infestation<br>25 | Light infestation<br>20 | Moderate infestation<br>35 | High infestation<br>20 |
| Dodder control methods adopted by farmers | Sever mowing<br>50 | Certified seeds<br>25 | Hand pulling<br>8 | Non<br>17 |
| Effectiveness of these methods | Not effective<br>70 | To some extend<br>25 | Effective<br>5 | |
| Necessity for effective control package | High need<br>68 | To some extend<br>27 | No need<br>5 | |

About percent of dodder infestation in clover fields, majority of the farmers in this questionnaire (85%) reported that they have dodder infestation in their clover fields. Meanwhile, 15% of the farmers stated that they have no problem with dodder in their clover fields (Fig 4).

Concerning severity of dodder infestation, Fig (5) revealed that 20% of farmers have high infestation level by dodder in their clover fields. About 20 and 35% of the farmers stated that they have light and moderately infestation levels, respectively. Only 25% of the infested fields have rare or little infection by dodder.

In respect of dodder control methods adopted by the farmers, the study recorded that 50% of the farmers applied sever mowing for dodder spots, 25% relay in using certified seeds, 8% of farmers practicing hand pulling for dodder spots. Meanwhile, 17% of the farmers did not follow any control measure for dodder infestation in their clover fields (Fig 6).

Results on the effectiveness of these methods for controlling dodder in clover fields showed that 70% of the farmers stated that mowing and hand pulling as practiced methods were not effective, 25% reported that these methods were effective to some extent. Only 5% of farmers reported that these methods were effective for controlling dodder in clover fields (Fig 7). This study revealed that 68% of farmers highly need effective dodder control package to face dodder infestation in their fields. 27% of the samples need this package to some extent. Only 5% of the farmers do not need package for dodder control (Fig. 8).

It could be concluded that there is an increment in dodder infestation in clover fields in Egypt and need to pay more attention to overcome this problem in clover, which represents the main source as green fodder in Egypt.

**VI. Dodder survey in clover fields in Menoufia governorate**

Data revealed that dodder infested all surveyed districts in Menoufia governorate and dodder infested 11.1% of total surveyed clover fields over mean of governorate. Infestation ranged from 5.7 in Al-Bagour to 16.8% in Ashmoon. Also, survey revealed that severity (%) or covered area by dodder represents 0.524% of total surveyed area in clover fields over governorate. Severity ranged from 0.140 in Ashmoon to 1.227 in Quesna as shown in Table (5).

The highest dodder infestation and severity percentages were recorded in Quesna and Ashmoun districts, as these districts recorded 16.0 and 16.8% infestation and 1.227 and 1.140% severity. Meanwhile, Al-Bagour and Shebin El-Koom districts recorded the lowest infestation (5.7 and 6.7%) and severity percentages (0.183 and 0.343%), respectively.

There is no good statistics on the extent of infestations by *Cuscuta* species. Stojanovic and Mijatovic (1973) revealed that over 80% of Lucerne and red clover fields were infested by *C. campestris* in Yugoslavia and 20% of these crops were abandoned. This survey through the light on the increment of dodder infestation in clover fields in Menoufia governorate, which represent the Nile Delta. Therefore, much more efforts

must be taken in consideration to face this problem and to find out more effective tools for their control in clover fields.

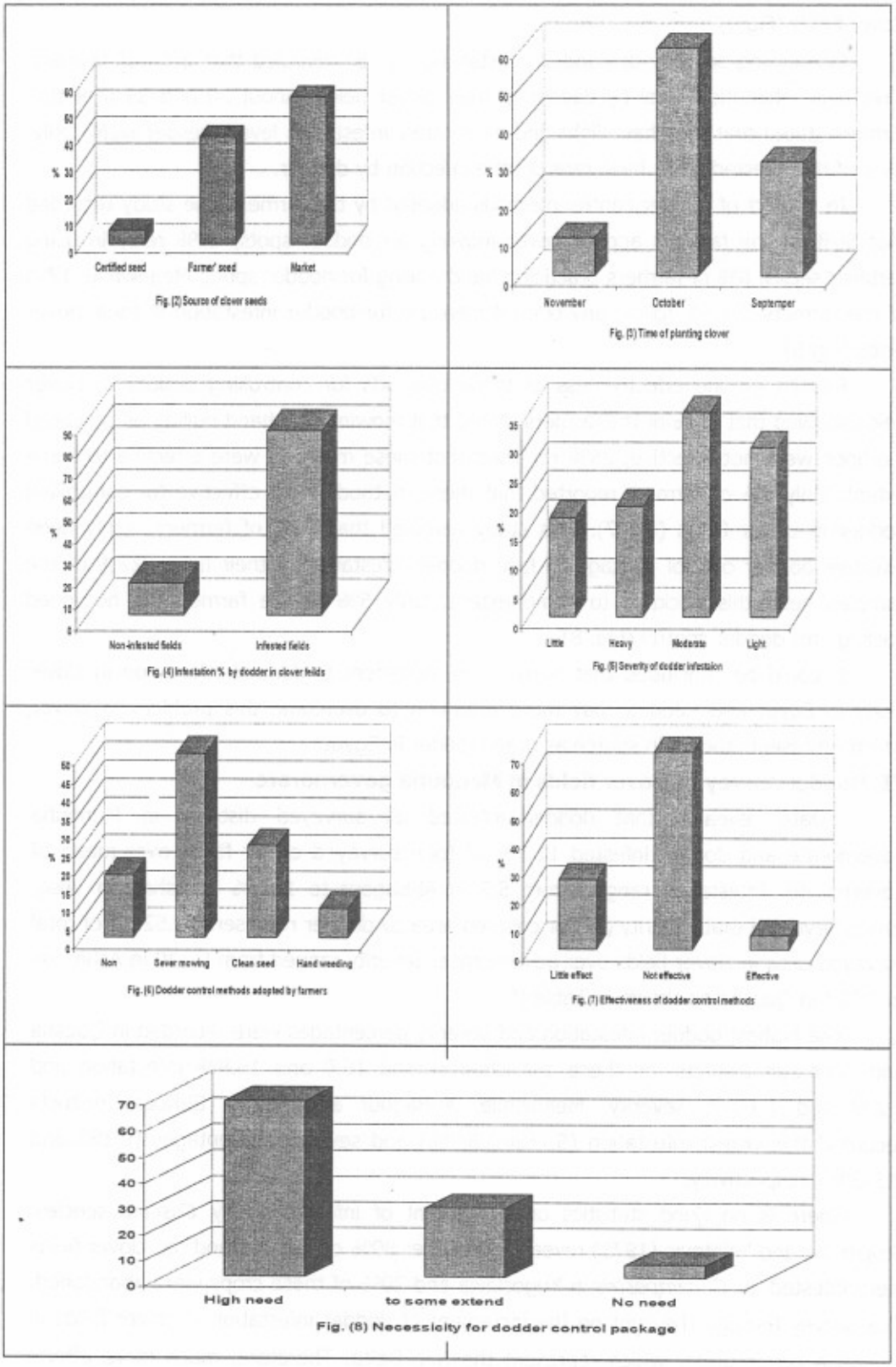

Table 5. Dodder infestation and severity in clover fields in Menoufia, 2004/2005 season.

| Districts | Number of surveyed fields | Infestation (%) | | Severity (%) | |
|---|---|---|---|---|---|
| | | Mean | SE | Mean | SE |
| Quesna | 40 | 16.0 | ± 4.19 | 1.227 | ± 0.485 |
| Ashmoon | 50 | 16.8 | ± 4.58 | 0.140 | ± 0.335 |
| Al-Bagour | 60 | 5.7 | ± 2.23 | 0.183 | ± 0.118 |
| Berket El-Sabae | 50 | 10.4 | ± 3.67 | 0.729 | ± 0.396 |
| Shibin EL-Kom | 60 | 6.7 | ± 2.12 | 0.343 | ± 0.151 |
| Over governorate | 260 | 11.12 | | 0.524 | |

These studies recommend that the effective package for dodder control in clover fields must include the following control measures:

1- Using clean or certified clover seeds for sowing clover.

2- Late summer or early autumn planting is advisable for winter crop i.e. clover, due to the poor growing of dodder seedlings with the low temperatures of the coming months.

3- Eradication of small patches of dodder at regular intervals by cutting, burning or by herbicide treatments to prevent further spread of the infestation.

4- *Cuscuta* seedlings are easily controlled by tillage since they are rootless. Repeated tillage at certain intervals is necessary to reduce dodder infestation.

5- Herbicides are the most effective control methods in the fields that are moderate to heavily infested by dodders. Several herbicidal treatments are reported as effective herbicides for dodder control in clover without any adverse effect on their growth for dodder such as pronamide, glyphosate and butralin (Abd El-Wahed, 1996; Zaki *et al*, 1998; Hassanein and Ibrahim, 2000; and Abd El-Hamid and Shebl, 2002).

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# دراسات على الاصابة بالحامول فى حقول البرسيم المصرى فى بعض محافظات دلتا النيل

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١- *المعمل المركزى لبحوث الحشائش – مركز البحوث الزراعية – الجيزة*

٢- *قسم بحوث الفلورا وتصنيف النباتات – معهد بحوث البساتين – مركز البحوث الزراعية – الجيزة*

تم اجراء اربعة دراسات خلال الفترة من ٢٠٠٠/٢٠٠١ حتى ٢٠٠٤/٢٠٠٥ فى ثلاثة محافظات فى الدلتا وهى محافظات كفر الشيخ والغربية والمنوفية بغرض دراسة مشكلة اصابة حقول البرسيم بالحامول. شملت الدراسات اجراء حصر فى عدد ٢٦٠ حفل برسيم بمحافظة المنوفية خلال شهرى ابريل ومايو ٢٠٠٥ شمل عدد خمسة مراكز هى شبين الكوم وقويسنا وبركة السبع وأشمون والباجور لبيان نسب وشدة الاصابة بالحامول فى حقول البرسيم بالمحافظة ودراسة نسبة التلوث ببذور الحامول فى تقاوى البرسيم تم اجراؤها فى اربعة مراكز بمحافظتى كفر الشيخ والغربية، حيث تم جمع عدد ٢٠٠ عينة تقاوى برسيم (١٥٠ عينة من المزارعين و٥٠ عينة من التقاوى المعتمدة). كما تم دراسة انبات بذور الحامول تحت درجات حرارة مختلفة (٥ و١٠ و١٥ و٢٠ و٢٥ و ٣٠ درجة مئوية) تحت ظروف المعمل لبيان درجة الحرارة المثلى للانبات وكذا المدى الحرارى المناسب للانبات. وتم اجراء استبيان فى محافظة كفر الشيخ اشتمل على عدد ١٥٠ مزارع لمعرفة مدى وعى المزارعين لمشكلة الاصابة بالحامول فى حقول البرسيم والطرق التى يتبعوها لمكافحته ومدى كفاءة هذه الطرق ومدى احتياجهم لحزمة توصيات أكثر فاعلية للحد من مشكلة زيادة الاصابة بالحامول فى البرسيم المصرى.

أظهرت هذه الدراسات أن ١١,١% من المساحات التى تم حصرها فى محافظة المنوفية كانت مصابة بالحامول فى شكل بقع متناثرة تراوح حجمها من ٠,٢٥ الى ١٤ متر مربع وسجلت شدة اصابة قدرها ٠,٥٢% من المساحة التى تم اجراء الحصر بها. وأوضحت أن درجة الحرارة المثلى لانبات حامول البرسيم كانت ١٥ درجة مئوية وتراوح المدى الحرارى الملائم لانبات الحامول من ١٠-٢٠ درجة مئوية.

كما أظهرت الدراسات أن ٨٧% من تقاوى البرسيم المجمعة من المزارعين كانت ملوثة ببذور الحامول وكان متوسط وزن بذور الحامول ١٤,٤٢ جرام / كجم تقاوى برسيم ، فى حين كانت لم تسجل عينات التقاوى المعتمدة اى نسبة تلوث ببذور الحامول مما يؤكد ان تقاوى البرسيم هى المصدر الرئيسى لانتشار الحامول فى حقول البرسيم.

كما أوضحت دراسات الاستبيان أن نسبة ٥% فقط من المزارعين يستخدمون التقاوى المعتمدة أو النظيفة لزراعة البرسيم وأن نسبة ٢٠% من المزارعين لديهم اصابات مرتفعة بالحامول فى شكل بقع متناثرة يتراوح حجمها من بين ١٠ – ١٤ متر مربع وانحصرت الوسيلة المتاحة لدى ٥٠% من المزارعين لمكافحة الحامول من خلال الحش او التقليع اليدوى. كما أشار ٧٠% من المزارعين الى عدم كفاءة هذه الطرق لمكافحة الحامول وقرر ٦٨% منهم الى حاجتهم الماسة الى حزمة توصيات أكثر فاعلية لمكافحة الحامول فى حقول البرسيم.