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# CONTROL OF BEET RUST BY NATURAL PLANT OILS AND SYSTEMIC FUNGICIDES

[15]

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## ABSTRACT

Six plant oils namely, Canola, Kanz, Soybean, Radish, Castor seed and Olive, were tested for their effect on inhibition of urediniospores germination of *Uromyces betae* and for the control of sugar beet rust. All the tested oils significantly inhibited germination of urediniospores, the most effective was Kanz oil (5ml/L.) followed by radish seed oil (25ml/L.). Plant oils as compared to Eminent fungicide were used to control beet rust disease under field natural condition. Commercial field plantations were chosen for plant oils applications in three sprays at 15-day intervals when the disease first appear in two locations and in the same growing season. Oils were applied at the rate of 25 ml/L. except Kanz oil was at 5 ml/L.. Oils effectively lowered disease incidence and severity in both locations but with slight ranking differences. Five systemic fungicides namely, Caramba, Sumi-8, Score, Opus and Eminent were also tested for their effect on urediniospores germination, all of them inhibited germination, the most effective one was sumi-8. The same systemic fungicides, were used under field natural infections in two locations, in three sprays at the recommend field doses when the disease first appears during 2002-2003 season. Disease severity was drastically decreased as compared to the untreated control. Regarding fungicide efficacy, Eminent ranked first followed by Opus, both Score and Sumi-8 and then Caramba, in a descending order.

**Key words:** Rust, sugar beet (*Beta vulgaris*), *Uromyces betae*, Fungicides and Natural plant oils

## INTRODUCTION

Sugar beet (*Beta vulgaris* L.) has been cultivated as a commercial crop for sugar production in Kafr El-Sheikh governorate (North Delta, Egypt) since 1982. About 40 % of the international sugar is produced from sugar beet (**Annual report of the Central Council for Sugar Crops, Ministry of Agriculture, Egypt, 2003**).

In Egypt rust of sugar beet, caused by *Uromyces betae* Tul. ex Kick, has ap-

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peared since 1967. It was considered to be economically unimportant till a sever outbreak was observed in sugar beet crop in 2000 growing season .

Natural plant oils were used experimentally in controlling some fungal diseases . **Northover and Schneider, 1993** have tested different oils against *Podosphaera leucotricha*. They found that oils of sunflower, olive, canola, corn, soybean and grape seeds were very effective against this pathogen. Soybean and maize oils were found to be effective against common smut of maize (**Moursy *et al* 2001**). Kanz oil was effective against downy mildew on grain sorghum (**Zein El-Abedeen and El-Menchawy, 2001**), and jojoba oil was effective against leaf rust pathogen (**Sallam *et al* 2001**).

Different attempts were carried out to control sugar beet rust disease by fungicides, using flutriafol-based fungicide; Geyser (difenoconazole); Score (difenoconazol); Lyric (flusilazole); Carbendazime+flusilazole and Eminent (**Brown *et al* 1986; Szilvasi, 1990; O'sullivan, 1996; Sorensen & Marcussen, 1996 and Chisholm, 1999 & Draz, 2001**).

The objective of this study was to investigate the efficacy of different natural plant oils and some systemic fungicides in controlling rust disease of sugar beet under field conditions .

## MATERIALS AND METHODS

### 1. Laboratory experiments

**Effect of plant oils and systemic fungicides on germination of urediniospores**

Canola seed oil, Soybean seed oil, Castor seed oil, Olive oil, Radish seed oil at 25 ml/L. and Kanz oil (extracted from Jojoba plant seeds at 5 ml/L.) were used. Oils (commercial products as food stuffs) were emulsified with slight agitation in distilled water and supplemented with tween 20 (0.15 ml/L. water) prior to application. Tap water was used as control. Germination was provided in drops of the prepared oil and/or fungicide water dilution on glass slides at 15°C in darkness. Germination (%) of urediniospores recorded at 2, 6, 12 and 24 hrs of incubation in 100 urediniospores within three replications of each oil.

Systemic fungicides, listed in **Table (1)** were tested. Fungicides were incorporated in distilled water at the commercial recommended rate of application and germination percent was recorded as previously mentioned.

### 2. Field experiments

Two experiments were carried out to test the effect of six plant oils and five systemic fungicides on controlling sugar beet rust in commercial fields in two regions, i.e. El-Raghama location, El-Reyad district, Kafr El-Sheikh governorate and Kafr El-Ghab location, Kafr Saad district, Damietta governorate during 2002-2003 growing season. The experiments were designed in complete randomized block design . Three replicates were used for each treatment . Each replicate consisted of five rows, each of 5m long and 50 cm apart, and 25 cm between plants, each row contained 20 plants. Plants were sprayed, with each oil or fungicide separately, three times at 15 day intervals immediately starting when the first natural infection of rust was observed. Data were recorded as disease incidence (DI) 15 days after treatment by determining the percentage of infected

Table 1. Common name, chemical formula, rate of application and concentration ppm, of fungicides tested against sugar beet rust disease pathogen .

| Trade name | Common name | Chemical name | Rate of application | Conc. ppm |
|---|---|---|---|---|
| Opus 12.5 % | Epoxiconazole (proposed) | (2RS, 3SR)-1-[3-(2-chlorphen-yl)-2,3-epoxy-2-(4fluorphenyl) propyl]-1H-1,2,4-triazole | 1 cm/L. water | 125 |
| Eminent 12.5 % | Tetraconazole | (+)-2-(2,4-dichlorophenyl)-3-(1H-1,2,4-triazol-1-yl) propyl 1,1,2,2-tetrafluoroethyl ether (IUPAC) | 1 cm/L. water | 125 |
| Score 25 % | Dipheconazole | 3-Chloro-4 (4-methyl)-2- (1h-1,2,4, triazol-1-ylmethyl) 1,3-Dioxolan-2-ylphenyl-4-Chorophenyl either (IUPAC) | 0.5cm/L. water | 125 |
| Sumi-8 5 % | Diniconazole | (E)-(R)-1-(2,4-dichlorophenyl)-4,4-dimethyl-2-(1H-1,2,4-triazol-1-yl)-pent-1-enn-3-ol (IUPAC) | 0.6cm/L. water | 30 |
| Caramba 6 % | Metconazole | (1RS, 5RS:1RS, 5SR)-5-(4-chloro-benzyl)-2,2-dimethyl-1-(1H-1,2,4-triazol-1-=ylmethyl) cyclopentanol | 1 cm/L. water | 60 |

plants for each replicate and the mean was calculated.

Disease severity (DS) was estimated visually on 20 plants selected at random from the middle two rows of each replicate according to the scale suggested by **Ata (2005), Table (2).**

Efficacy (%) for each treatment was calculated according to the equation adopted by **Rewal and Jhooty (1985)** for the DI and DS readings as follows:

$$\text{Efficacy}(\%) = \left(1 - \frac{\%\text{Disease severity in the treatment}}{\%\text{Disease severity in the control}}\right) \times 100$$

## 2.1. Effect of natural plant oils

Oils of Canola, Kanz, Soybean, Radish, Castor seed and Olive, were emulsified with slight agitation in distilled water as described before in laboratory experiments. Oils were sprayed on plants using hand sprayer; 2L. capacity . Tween 20, as surfactant, was added to the oil water mixture at the rate of 0.25 ml/L. Eminent, as a fungicide in addition to an untreated check were used.

## 2.2. Effect of systemic fungicides

Caramba, Sumi-8, Score, Opus and Eminent were tested to control the disease in field by using the methods previously described for oils at rates of application recommended **(Table 1).**

The results were analyzed separately using analysis of variance procedures and differences among disease severities were compared using the least significant difference (LSD).

Table 2. Adopted scale for rust disease assessment . Number of pustules per leaf, % leaf infected area per total leaf area, disease categories (1-6) and calculated % disease severity (1-40 %).

| Disease category | No. of pustules /per leaf | % leaf infected area /leaf area | % disease severity |
|---|---|---|---|
| 1 | 1 - 10 | 0.04 - 0.4 | 1 |
| 2 | 11 - 40 | 0.44 - 1.6 | 5 |
| 3 | 41 - 90 | 1.64 – 3.6 | 10 |
| 4 | 91 - 160 | 3.64 – 6.4 | 20 |
| 5 | 161 - 250 | 6.44 – 10.0 | 30 |
| 6 | 251 - 360 | 10.04 – 14.4 | 40 |

## RESULTS

### 1. Laboratory tests

### 1.1. Effect of plant oils on germination of urediniospores

Results, Table (3), show that no spore germination occurred in Canola, Soybean, Olive, Radish and Kanz oils after two hours of incubation. Significant differences appeared between the control (untreated) and the oil treatments and between oils in the same incubation period. The results also show that germination increased by increasing incubation period in all oils. Kanz oil showed the highest inhibitive degree of germination followed by Radish seed, Castor seed, Canola seed, Soybean seed and Olive oils, respectively, after 24 hours of incubation.

### 1.2. Effect of fungicides on germination of urediniospores

Results, Table (4), show that spores germination was increased by increasing incubation periods for all fungicides. Significant differences appeared between the control (untreated with fungicides) and all fungicide treatments. No significant differences appeared between fungicide treatments at the same incubation period. Results, also, show that after 24 hours, significant differences appeared between the control and all fungicides and between fungicides as being inhibitive to germination.

Table 3. Effect of six plant oils on germination of urediniospores of *U. betae* affected at 15°C.

| Plant oils | Degrees* of urediospores germination /after h | | | |
|---|---|---|---|---|
| | 2 h | 6 h | 12 h | 24 h |
| Control | 4.623 | 12.880 | 19.360 | 22.780 |
| Olive | 0.000 | 4.623 | 15.3167 | 19.360 |
| Soybean | 0.000 | 4.623 | 12.880 | 18.440 |
| Canola | 0.000 | 8.747 | 14.1467 | 16.410 |
| Castor | 4.623 | 8.130 | 15.340 | 15.340 |
| Radish | 0.000 | 0.000 | 8.130 | 13.6867 |
| Kanz | 0.000 | 4.623 | 7.950 | 11.480 |
| L. S. D.(0.05) | 3.9113 | 4.9205 | 2.0753 | 1.9372 |

* Readings transformed as the arcsine of the percentage of spore germination

Table 4. Effect of five systemic fungicides on germination of urediniospores of *U. betae*.

| Fungicides | Degrees* of urediospores germination / after h | | | |
|---|---|---|---|---|
| | 2 h | 6 h | 12 h | 24 h |
| Control | 4.623 | 12.880 | 19.360 | 22.78 |
| Caramba | 1.913 | 7.950 | 9.883 | 14.18 |
| Score | 0.000 | 4.623 | 9.883 | 12.92 |
| Eminent | 0.000 | 4.623 | 7.950 | 12.88 |
| Opus | 0.000 | 4.623 | 7.950 | 11.54 |
| Sumi 8 | 0.000 | 5.740 | 7.333 | 9.98 |
| L. S. D. (0.05) | 3.8733 | 5.5616 | 3.0475 | 1.1232 |

* Readings transformed as the arcsine of the percentage of spore germination before analysis

The most effective fungicide was Sumi-8, followed by Opus, Eminent, Score and Caramba.

## 2. Field tests

### 2.1. Control of sugar beet rust by plant oils

Commercial field plantations were randomly chosen for oil application sprays together with Eminent fungicide for comparison. Results, **Tables (5 and 6)** show the percentages of rust infection [disease incidence (DI) and severity (DS)], as being affected by oils. Results of the third spray were considered for final results and conclusion.

Gradual increase in disease severity continued in the control (untreated) treatment and with less increase in treatments received one to three sprays in the two locations.

Oil effects in both locations slightly differed. Ranking order of oil effects differed for particular oil(s). Nevertheless, significant differences between the untreated control and oils and non significant in-between oils after the third spray application 15 days later and one month before harvesting occurred.

Table 5. Effectiveness of plant oils for control of beet rust caused by *U. betae* under field natural infection during 2002-2003 growing season at Kafr El-sheikh governorate.

| Oils | 1st spray | | 2nd spray | | 3rd spray | | Efficacy % | | Ranking |
|---|---|---|---|---|---|---|---|---|---|
| | DI % | DS % | DI % | DS % | DI % | DS % | DI % | DS % | |
| Control | 21.00 | 10.00 | 46.33 | 26.67 | 60.00 | 33.33 | ..... | ..... | ..... |
| Olive | 17.67 | 8.33 | 25.00 | 10.00 | 32.00 | 10.00 | 46.67 | 70.00 | 4 |
| Soybean | 15.33 | 6.67 | 29.00 | 10.00 | 33.67 | 13.33 | 43.88 | 60.01 | 3 |
| Canola | 18.67 | 8.33 | 34.33 | 13.33 | 34.33 | 13.33 | 42.78 | 60.01 | 3 |
| Castor | 13.33 | 6.67 | 18.67 | 8.33 | 24.67 | 10.00 | 58.88 | 70.00 | 2 |
| Radish | 10.33 | 5.33 | 18.00 | 8.33 | 24.67 | 8.33 | 58.88 | 75.00 | 1 |
| Kans | 16.00 | 6.67 | 20.33 | 8.33 | 23.33 | 8.33 | 61.12 | 75.00 | 1 |
| Eminent | 10.67 | 6.67 | 12.00 | 6.67 | 12.00 | 5.33 | 80.00 | 84.01 | .... |
| L. S. D. (0.05) | 5.252 | 6.165 | 5.309 | 5.778 | 5.096 | 5.254 | ..... | ..... | .... |

DI = Disease incidence DS = Disease severity

Table 6. Effectiveness of plant oils for control of beet rust caused by *U. betae* under field natural infection during 2002-2003 growing season at Damietta governorate.

| Oils | 1st spray | | 2nd spray | | 3rd spray | | Efficacy % | | Ranking |
|---|---|---|---|---|---|---|---|---|---|
| | DI % | DS % | DI % | DS % | DI % | DS % | DI % | DS % | |
| Control | 19.67 | 13.33 | 47.67 | 23.33 | 72.00 | 36.67 | ..... | ..... | ..... |
| Olive | 20.00 | 10.00 | 32.67 | 20.00 | 40.33 | 20.00 | 44.00 | 45.46 | 4 |
| Soybean | 17.67 | 8.33 | 31.67 | 11.67 | 40.00 | 16.67 | 44.44 | 54.54 | 3 |
| Canola | 15.00 | 8.33 | 39.00 | 16.67 | 39.67 | 16.67 | 44.90 | 54.54 | 3 |
| Castor | 15.33 | 8.33 | 18.33 | 10.00 | 22.33 | 13.33 | 69.00 | 63.65 | 2 |
| Radish | 14.33 | 8.33 | 18.33 | 13.33 | 22.33 | 13.33 | 69.00 | 63.65 | 2 |
| Kans | 13.00 | 6.67 | 20.00 | 10.00 | 21.00 | 10.00 | 70.83 | 72.73 | 1 |
| Eminent | 10.67 | 5.33 | 13.33 | 6.67 | 13.67 | 8.33 | 81.01 | 77.28 | ..... |
| L. S. D. (0.05) | 5.801 | 5.220 | 10.989 | 7.275 | 10.812 | 7.111 | ..... | ..... | ..... |

DI = Disease incidence DS = Disease severity

Oils effectively lowered disease incidence and severity. Eminent, chemical fungicide, showed the highest effect against rust disease occurrence in both locations. In Kafr El-Sheikh it was followed by Kans, Radish, Castor, Olive, Soybean and Canola oils in a descending order. In Damietta, Eminent was followed by Kans, Radish, Castor, Soybean, Canola and Olive in descending order.

Kans, Radish, and Castor oils exhibited the highest values of effectiveness in control beet rust disease in Kafr El-Shiekh and with lower efficacy in Damietta.

**2.2. Control of sugar beet rust by systemic fungicides**

Five systemic fungicides were tested to control rust disease of sugar beet in two locations; Damietta and Kafr El-Sheikh governorates during 2002-2003 growing season. Results, Tables (7 and 8) show the percentages of rust infection (DI and DS) as being affected by fungicides in the successive sprays and the control. Results of the third spray were considered for final results and conclusion. Gradual increase in disease severity continued in the control treatment and

Table 7. Effectiveness of certain systemic fungicide(s) on the control of beet rust caused by *U. betae* under field natural infection during 2002-2003 growing season at Kafr El-sheikh .

| Fungicide | 1st spray | | 2nd spray | | 3rd spray | | Efficacy % | | Ranking |
|---|---|---|---|---|---|---|---|---|---|
| | DI % | DS % | DI % | DS % | DI % | DS % | DI % | DS % | |
| Control | 21.00 | 10.00 | 46.33 | 26.67 | 60.00 | 33.33 | ..... | ..... | ..... |
| Caramba | 13.00 | 8.33 | 18.00 | 10.00 | 18.00 | 13.33 | 70.00 | 60.01 | 4 |
| Sumi-8 | 10.67 | 6.67 | 14.67 | 8.33 | 16.33 | 8.33 | 72.78 | 75.01 | 3 |
| Score | 10.67 | 6.67 | 12.67 | 8.33 | 15.67 | 8.33 | 73.88 | 75.01 | 3 |
| Opus | 8.33 | 6.67 | 12.00 | 6.67 | 12.67 | 6.67 | 78.88 | 80.00 | 2 |
| Eminent | 10.67 | 6.67 | 12.00 | 6.67 | 12.00 | 5.33 | 80.00 | 84.00 | 1 |
| L. S. D. (0.05) | 7.045 | 5.175 | 7.545 | 5.404 | 5.543 | 6.203 | ..... | ..... | ..... |

DI = Disease incidence
DS = Disease severity

Table 8. Effectiveness of certain systemic fungicide(s) on the control of beet rust caused by *U. betae* under field natural infection during 2002-2003 growing season at Damietta.

| Fungicide | 1st spray | | 2nd spray | | 3rd spray | | Efficacy % | | Ranking |
|---|---|---|---|---|---|---|---|---|---|
| | DI % | DS % | DI % | DS % | DI % | DS % | DI % | DS % | |
| Control | 19.67 | 13.33 | 47.67 | 23.33 | 72.00 | 36.67 | ..... | ..... | ..... |
| Caramba | 10.67 | 8.33 | 14.67 | 13.33 | 21.00 | 16.67 | 70.83 | 54.54 | 4 |
| Sumi-8 | 10.33 | 6.67 | 13.00 | 10.00 | 14.67 | 13.33 | 79.63 | 63.65 | 3 |
| Score | 8.33 | 5.33 | 9.33 | 8.33 | 13.33 | 10.00 | 81.49 | 72.73 | 2 |
| Opus | 10.67 | 6.67 | 14.67 | 10.00 | 14.67 | 10.00 | 79.63 | 72.73 | 2 |
| Eminent | 10.67 | 5.33 | 13.33 | 6.67 | 13.67 | 8.33 | 81.01 | 77.28 | 1 |
| L. S. D. (0.05) | 4.856 | 7.003 | 3.633 | 4.883 | 5.478 | 6.238 | ..... | ..... | ..... |

DI = Disease incidence
DS = Disease severity

with less increase in treatments received one to three sprays. Fungicides obviously decreased both disease incidence and severity, showing significant differences with the control in both locations, but not in-between particular fungicide and others. Hence, no particular recommendation for fungicide(s) could be valid and all of them could be used for beet rust control. However, according to fungicide efficacy, fungicides ranked as Eminent, Opus, both Score and Sumi-8 and then Cramba and could preferably used as mentioned.

Results showed that successive sprays at limited intervals are recommended for disease partial control. Fungicide(s) effects differed by the effectiveness of the number(s) of sprays as shown by disease suppression at particular spray number for economic consideration.

## DISCUSSION

Sugar beet rust has a great influence on plant productivity and sugar content (**O'sllivan, 1996; Mittler *et al* 2004 and Ata *et al* 2005**). Different attempts were carried out to control several other diseases either by natural oils or some systemic fungicides. Regarding the effect of plant oils on germination of urediniospores, all tested oils reduced germination. This is in agreement with **Brunelli and Roberti, 1997**. They found that grape-seed oil mixed with Tween 20 reduced the germination of the conidia, and did not kill all the mycelium of *Sphaerotheca fuliginea*, the cause of powdery mildew of Zucchini. Their results suggested that these compounds, based on fatty acids, can exert a fungistatic effect.

Regarding the control effects of plant oils under field natural infection, oils effectively lowered disease incidence and severity. **Maruzella, 1963** reported that plant oils have antimicro-biological activity against plant diseases. Recent results also gave evidence to the superiority of Kans, Radish and Costar oils. Similar results were recorded by **Northover and Schneider, 1996; Bekheet *et al* 1999; Hammouda, *et al* 1999; Moursy *et al* 2001; Zein El-Abedeen and El-Menchawy, 2001 and Sallam *et al* 2001**, working on different oils, pathogens and hosts.

Reduction of infection on naturally infected plant leaves due to activity of plant oils may be attributed to many factors such as inhibition of the pathogen structures on infected leaf area and prevention of infection on healthy new developed leaves. Similar explanation was reported by **Sallam *et al* 2001**. They reported that reduction in leaf rust severity in wheat plants treated with jojoba oil may be due to the effect of the oil which makes a mechanical barrier to prevent the invasion of urediospore germ tube. **Northover and Schneider, 1993,** reported that efficacy of certain oils against particular pathogenic fungi may be related more to induced physiological changes in the host pathogen interaction than to differences in the chemical composition of the oil (**Hammouda *et al* 1999**).

Concerning the effect of five systemic fungicides used under natural infection, results showed that fungicides obviously decreased disease severity. Similar results were found by **O'Sullivan, 1996; Sorensen and Marcussen, 1996; Liguori *et al* 1997 and Draz, 2001**. Results also gave evidence to the superiority of Eminent, Opus, and Score. Successive sprays at limited intervals are recommended for disease partial control. The same recom-

mendation was given in U.S.A (**Bredehoeft, 2001**).

Under Egyptian conditions effectiveness of the respective sprays, one to three, depends on (1) the available rust inoculum after each spray (the initial for the following spry), (2) the special ability of each fungicide spray to have long residual effect (before fungicide degradation and/or depletion) until the following spray .

Number of fungicide applications needed for disease control differed by governorate, more applications are advisable for Damietta. This may be due to the higher disease severity correlated with favorable climatic conditions (**Ata, 2005**).

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١. قسم أمراض الذرة والمحاصيل السكرية- معهد بحوث أمراض النباتات- مركز البحوث الزراعية- الجيزة- مصر
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تم دراسة تأثير بعض الزيوت النباتية على تثبيط إنبات الجراثيم اليوريدية للفطر *U. betae* المسبب لمرض صدأ بنجر السكر باستخدام زيت الكانولا وزيت فول الصويا وزيت الفجل وزيت الخروع وزيت الزيتون (بتركيز ٢٥ مل/ لتر) وزيت الكانز (بتركيز ٥ مل/ لتر) وذلك خلال ساعتين من بداية التحضين ولمدة ٢٤ ساعة وقد وجد أن الإنبات يزداد بزيادة فترة التحضين حتى ٢٤ ساعة تحضين.

وقد وجد من النتائج أن جميع الزيوت المستخدمة تثبط انبات الجراثيم اليوريدية للفطر وكان زيت الكانز أفضل الزيوت المستعملة تثبيطا ولة فعالية عالية ضد إنبات الجراثيم اليوريدية.

استخدمت نفس الزيوت السابقة وبنفس التركيزات لمكافحة مرض صدأ أوراق البنجر في الحقل رشا في ثلاث رشات متعاقبة كل ١٥ يوم وفي منطقتين مختلفتين في نفس الموسم، وقد أظهرت معظم الزيوت المستخدمة كفاءة عالية بخفض نسبة ظهور المرض وشدته في كلا المنطقتين مع اختلافات بسيطة. وكان أكثرها فاعلية هو زيت الكنز يليه زيت بذور الفجل ثم زيت بذور الخروع.

كما اختبر تأثير بعض المبيدات الجهازية على إنبات الجراثيم اليوريدية للفطر وقد كان أكثر المبيدات المستخدمة فعالية ولة تأثير مثبط هو مبيد سومي ٨ (Sumi-8) يلية المبيدات أوبيص (Opus)، إيمننت (Eminent)، سكور(Score) ثم كارمبا (Caramba) على الترتيب، مع استعمال هذه المبيدات في محلول مائي حسب التركيزات الموصي بها حقليا.

أختبرت نفس المبيدات السابقة في مكافحة صدأ البنجر في الحقل في جهتين مختلفتين فى نفس الموسم على ثلاث رشات بين كل رشة والأخرى ١٥ يوم تبدأ عند

بداية ظهور المرض، وقد استعملت بنفس التركيزات الموصي بها حقليا وقد أدي استعمالها إلى خفض واضح في شدة الإصابة، ولم يشاهد فروق معنوية بين المبيدات وبعضها ولكن عند اخذ الكفاءة في الاعتبار كان المبيد ايمننت لكثر فاعلية يليه أوبيص ثم كلا من اسكور وسومى- ٨ ثم كارامبا.

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