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EVALUATION OF SOME FUNGICIDES AND THEIR MIXTURES FOR THE CONTROL OF TOMATO LATE BLIGHT (*Phytophthora infestans*) IN EL-ESMAELIA GOVERNORATE.

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ABSTRACT

Eight fungicides (Tridex 80%, Tridex 75%, Mancozan 80%, Antracol 70%, Previcur N 72.5%, Rido copper 50%, Vacomil 35% and Chlorothit 75%) and six mixtures of fungicides (Aromil MZ 72%, Kaproksat-Gold 72%, Sereno 60%, Cure-plus 50%, Ridomil Gold Plus 42.5% and Galben copper 46%) were evaluated in El-Esmaelia Governorate during two different consective seasons of summer 2009 and winter 2010 for their efficacy on late blight disease (*Phytophthora infestans*) incidence and fruit yield of tomato. All the fungicides were applied at recommended rates. The control showed the greatest disease incidence. All treatments significantly reduced disease severity and raised the yield of tomato compared with untreated control. The tested mixtures of fungicides were more efficient in controlling late blight than using fungicides alone. Ridomil-Gold-Plus, Sereno, Kaproksat-Gold and Aromil-MZ were more effective in controlling late blight followed by Cure-plus, Galben copper, Chlorothit, Vacomil and Previcur-N, followed by three formulations of mancozeb (Tridex 80%, Tridex 75% and Mancozan 80%), while Antracol and Rido-copper were the least effective ones. Generally, application of the fungicide 10- day intervals during tomato growth, was required to protect the plants from natural infection of late blight, which resulted in increasing the yield of tomato fruits.

INTRODUCTION

Tomato (*Lycopersicon esculentum* Mill.) is the most important vegetable crop in Egypt. Production of high quantity and quality tomato fruits is complicated as they are vulnerable to diseases and pests, the severity of attack depending on environmental factors [Dillard & Cobb (1998) and Marshall – Ferrer *et al*. (1998)]. Late blight is a highly destructive disease affecting tomato particularly when weather is consistently cool and rainy. Late blight is caused by the phycomycetous fungus *Phytophthora infestans* (Mont.) de Bary. The fungus attacks all aboveground parts of the tomato plant. Pathogen life cycle can be completed in 3-4 days and rapid inoculum build up commonly occurs in fields during favorable weather (average temperature between 20 and 22^{o}C and high relative humidity or in rainy weather), which leads to high progress of epidemic rate. Under these conditions, protectant and curative fungicide applications are required to prevent this pathogen damage.

Systemic and non – systemic fungicides have been used by many investigators to control late blight disease caused by *Phytophthora infestans* on tomato. For example, mancozeb was evaluated by Baider & Cohen (2003), Chowdhury & Mitra (2006), Arie *et al*., (2007), Sobolewski *et al*. (2009), propineb by Singh (2008) and Frenkel *et al*., (2010), propamocarb

hydrochloride by Stevenson (2009), copper oxychloride by Mustafee *et al*., (2007) and Shailbala – Pundhir (2008 a&b), metalaxyl by Groves & Ristaino (2000), Rubin & Cohen (2006), Arie *et al*., (2007) and GuiNing *et al*. (2008), cymoxanil by GuiNing *et al*., (2008) and Stevenson (2009). Chlorothalonil is the primary fungicide used on tomatoes because it consistently provides an acceptable levels of control of late blight (Groves & Ristaino, 2000; Hariki, 2006; Arie *et al*., 2007; Stevenson, 2009 and Sobolewski *et al*., 2009).

On the other hand, the protectant fungicide mancozeb is often used to control this disease either alone or in combination with metalaxyl (El-Shimy & Tomader, 2006; Chowdhury & Mitra, 2006; Naskar et al., 2006; Mustafee *et al*., 2007; Islam *et al*., 2008; Shailbala – Pundhir 2008 b; Singh, 2008 and Mantecon, 2009), cymoxanil (Groves & Ristaino, 2000 and Stein & Kirk, 2002), benalaxyl (El-Shimy & Tomader,2006), mefenoxam (Mantecon, 2009) or fenamidone (Muchiri *et al*., 2009). Also, copper oxychloride is used to control this disease in combination with metalaxyl (Tomescu, 2002).

The present investigation was conducted to evaluate the efficiency of commercial products, some of which are mixtures, against late blight disease of tomato under field conditions.

MATERIALS AND METHODS

Fungicides:

Fourteen commercial fungicides, represent different chemical groups, eight fungicides and six mixtures of fungicides, were selected to the present work. Samples of these fungicides were obtained as gift from the project 561which carried out in Plant Protection Department, Faculty of Agriculture, Al-Azhar University, Cairo under the title "control of tomato diseases". These fungicides are listed in Table (1).

Field experiments:

This trial was conducted to evaluate the efficiency of fungicidal formulations and their mixtures for controlling the incidence of naturally infected late blight disease on tomato grown under field conditions, (El-Esmaelia Governorate) during two consective seasons of summer 2009 and winter 2010 and consequently the effect of these treatments on the increment of tomato yield. Tomato seeds were planted in plastic flats containing a mixture of sand and peat moss (1 : 1) at 25-30^{o} C and relative humidity 50-70%. A 5-week-old seedlings of tomato were transplanted within the double row, 1.0 m, which were spaced approximately 50 cm apart. The treatments were arranged in a randomized complete design with 3 replicates, each replicate contained 40 plants. The replicates were sprayed with the tested fungicides and ⁄ or their mixtures. All treatments were applied five times with 10 days intervals during the plant growth season. The first time was applied 15 days after planting. Disease severity was examined at the 65 day of planting.

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In both growing seasons, the following results were recorded:

1- Disease severity was inspected using the 1 to 6 scale recommended CRS/NAPIAP, where 1 = 0, 2 = 1 to 10, 3 = 11 to 30, 4 = 31 to 70, 5 = 71 to 90 and 6 = 91 to 100% leaf surfaces are diseased (Dillard *et al*., 1997). The severity of disease calculated according to the equation suggested by Townsed and Huberger, 1943 as follows:

$$\% \text{ Severity} = \frac{\text{sum of } (n \cdot v)}{6N} \times 100$$

Where:

n = number of leaves within infection category

V = numerical value of each leave.

N = total number of leaves.

2- Efficacy of treatments on disease severity % (as % reduction in disease severity) was assessed by the following equation:

$$\text{Efficacy} = \frac{\text{\% of disease severity in control - \% of disease severity in treatment}}{\text{\% of disease severity in control}} \times 100$$

3- Fruit yield was recorded for each treatment as well as check plants. Increase % in fruit yield was calculated as follow:

$$\% \text{ increase} = \frac{\text{fruit yield in treatment - fruit yield in control}}{\text{fruit yield in treatment}} \times 100$$

The results were statistically analyzed according to Snedecor & Cochran (1969).

RESULTS AND DISCUSSION

Effect of fungicides against naturally occurring late blight on tomato.

The severity of late blight disease in tomato plants under field conditions during the two successive seasons (summer 2009 and winter 2010) was 46.55 and 64.86 % in control treatment, respectively (Table 2). The final severity of late blight disease was lowest on plants sprayed with fungicides according to untreated plants. The least percentages of disease severity were recorded when recommended rates of Ridomil-Gold-Plus, Sereno, Kaproksat-Gold and Aromil-MZ were used (3.66, 4.05, 4.11 and 5.18 % in summer 2009, respectively, and 4.33, 5.88, 7.55 and 7.54 % in winter 2010, respectively). In other words, the first forementioned treatment was the most powerful treatment in reducing the severity of the disease (this reduction was about 14 fold less than that of control). Results in Table (2) also indicated that schedule spraying of the fungicides 10- day intervals could reduce the incidence of late blight on tomato grown under field condition. The tested mixtures of fungicides were more efficient in controlling late blight than using fungicides alone. For example, Rido-copper (copper oxychloride), Mancozan (mancozeb) and Vacomil (metalaxyl) reduced the incidence of the disease to 10.56, 8.88 and 7.29 % on tomato leaves in the first season, respectively, and to 12.97, 11.12 and 9.53 % on tomato leaves in the second season, respectively, but Cure-plus (copper oxychloride + metalaxyl) and Aromil-MZ (mancozeb + metalaxyl) reduced the incidence of the disease to

6.49 and 5.18 % on tomato leaves in the first season, respectively, and to 8.67 and 7.54 % on tomato leaves in the second season, respectively. Ridomil-Gold-Plus, Sereno, Kaproksat-Gold and Aromil-MZ were more effective in controlling late blight caused by *Phytophthora infestans*, followed by Cure-plus, Galben copper, Chlorothit, Vacomil and Previcur-N, followed by the three formulations of mancozeb (Tridex 80% WP, Tridex 75% DG and Mancozan 80% WP), while Antracol and Rido-copper were the least effective ones. These results were true during the two tested seasons.

Table (2): Efficiency of fungicides in controlling the naturally incidence of late blight on tomato grown under field conditions during the two seasons (summer 2009 and winter 2010).

Treatments	Disease severity		% Reduction		
	Summer 2009	Winter 2010	Summer 2009	Winter 2010	Mean
Control	46.55	64.86			
Tridex 80% WP	8.72	11.17	81.27	82.78	82.03
Tridex 75% DG	8.78	10.85	81.14	83.27	82.21
Mancozan 80% WP	8.88	11.12	80.92	82.86	81.89
Antracol 70% WP	9.57	13.00	79.44	79.96	79.70
Previcur-N 72.5% SL	7.75	10.26	83.35	84.18	83.77
Rido-copper 50% WP	10.56	12.97	77.31	80.00	78.66
Vacomil 35% WP	7.29	9.53	84.34	85.31	84.83
Chlorothit 75% WP	7.00	10.22	84.96	84.24	84.60
Aromil-MZ 72% WP	5.18	7.54	88.87	88.37	88.62
Kaproksat-Gold 72% WP	4.11	7.55	91.17	88.36	89.77
Sereno 60% WG	4.05	5.88	91.30	90.93	91.12
Cure-plus 50% WP	6.49	8.67	86.06	86.63	86.35
Ridomil-Gold-Plus 42.5% WP	3.66	4.33	92.14	93.32	92.73
Galben copper 46% WP	6.62	9.33	85.78	85.62	85.70
L.S.D. at 5%	1.62	1.80			
L.S.D. at 1%	2.16	2.41			

Regarding the severity of disease, all treatments in Table (2) were significantly reduced disease severity at two levels of p. compared with untreated control. The L.S.D. values for treatments revealed that Ridomil-Gold-Plus, Sereno, Kaproksat-Gold and Aromil-MZ significantly reduced the severity of disease more than other fungicidal treatments. The differences between Chlorothit and three formulations of mancozeb were significant only at 5% level of p. in the first season, but were not significant in second season. The differences between three formulations of mancozeb and Antracol were not significant in season 2009, but these were significant only at 5% level of p. in season 2010. Also, there were significant differences between three formulations of mancozeb and Rido-copper only at 5% level of p. in two seasons. On the other hand, the activity difference between Antracol and Rido-copper was not significant in the two tested seasons.

Data in Table (2) showed that the application of fungicides on tomato reduced the late blight disease severity from 78.66 to 92.73 %. Our results indicated that the severity of late blight disease on tomato reduced by mixtures of fungicides spray comparing with the fungicides alone.

Generally, it could be mentioned that the tested fungicides and mixtures of fungicides have a curative and protective effects against *Phytophthora infestans*.

Effect of treatments on fruit yield of tomato.

Results listed in Table (3) showed the effect of treatments on tomato fruits yield (kg / plant) compared with untreated control. It seemed that fruit yield was 2.09 and 1.98 kg / plant when the plants were naturally infected with *Phytophthora infestans* in the two tested seasons, respectively. This indicated that infection of tomato with *Phytophthora infestans* greatly reduced fruit yields. All treatments significantly increased the yield of tomato more than the control. The best yields were obtained through the use of Ridomil-Gold-Plus, Sereno, Kaproksat-Gold and Aromil-MZ (at recommended rates) which highly controlled the late blight. Antracol and Rido-copper (which had the lower fungicidal activity), also gave the lowest yields. Ridomil-Gold-Plus, Kaproksat-Gold, Sereno and Aromil-MZ were the most effective fungicides for increasing the fruit yield, followed by Cure-plus, Galben copper, Vacomil, Chlorothit, and Previcur-N, followed by three formulations of mancozeb (Tridex 80% WP, Tridex 75% DG and Mancozan 80% WP), and later Rido-copper and Antracol. Also, the tested mixtures of fungicides significantly increased the yield of tomato more than fungicides alone. For example, Rido-copper (copper oxychloride), Mancozan (mancozeb) and Vacomil (metalaxyl) gave fruit yield of 2.4, 2.69 and 3.23 kg / plant, respectively, in the first season and 2.5, 2.78 and 3.39 kg / plant, respectively, in the second season, but Cure-plus (copper oxychloride + metalaxyl) and Aromil-MZ (mancozeb + metalaxyl) gave fruit yield of 3.49 and 3.73 kg / plant, respectively, in the first season and 3.46 and 3.76 kg / plant, respectively, in the second season.

Table (3): Efficacy of fungicides on fruit yield of tomato in both seasons (summer 2009 and winter 2010).

Treatments	Yield Kg / plant		% increase in fruit yield		
	Summer 2009	Winter 2010	Summer 2009	Winter 2010	Mean
Control	2.09	1.98			
Tridex 80% WP	2.78	2.70	24.82	26.67	22.75
Tridex 75% DG	2.70	2.82	22.59	29.79	26.19
Mancozan 80% WP	2.69	2.78	22.30	28.78	25.54
Antracol 70% WP	2.42	2.43	13.64	18.52	16.08
Previcur-N 72.5% SL	2.99	3.20	30.10	38.13	34.12
Rido-copper 50% WP	2.40	2.50	12.92	20.80	16.86
Vacomil 35% WP	3.23	3.39	35.29	41.95	38.62
Chlorothit 75% WP	3.22	3.31	35.09	40.18	37.64
Aromil-MZ 72% WP	3.73	3.76	43.97	47.34	45.66
Kaproksat-Gold 72% WP	3.95	3.77	47.09	47.48	47.29
Sereno 60% WG	3.93	3.97	46.82	50.13	48.48
Cure-plus 50% WP	3.49	3.46	40.11	42.77	41.44
Ridomil-Gold-Plus 42.5% WP	3.96	3.84	47.22	48.44	47.83
Galben copper 46% WP	3.41	3.50	38.71	43.43	41.07
L.S.D. at 5%	0.18	0.16			
L.S.D. at 1%	0.23	0.22			

Regarding the yield of tomato, the L.S.D. values for treatments in Table (3) revealed that Ridomil-Gold-Plus, Kaproksat-Gold and Sereno significantly raised the yield of tomato more than other fungicidal treatments. The statistical analysis showed that Aromil-MZ significantly increased the yield of tomato more than Cure-plus and Galben copper. Also, the difference between Galben copper or Cure-plus and Vacomil was significant only at 5% level of p. in season 2009, but it was not significant in season 2010. The statistical analysis showed that the difference between Cure-plus and Chlorothit was significant in season 2009, but it was not significant in season 2010. The statistical analysis showed that the fungicidal difference between Galben copper and Chlorothit was significant only at 5% level of p. in the two tested seasons. The difference between Vacomil and Previcur-N was significant in the two tested seasons. The difference between Chlorothit and Previcur-N was significant in season 2009, but it was not significant in season 2010. Also, the differences between Previcur-N and three formulations of mancozeb were significant in the two tested seasons. The three formulations of mancozeb had no significant differences in their effects. The differences between the fungicidal activity of formulations of mancozeb and Rido-copper or Antracol were significant in the two tested seasons.

Data in Table (3) showed that the application of fungicides on tomato increased the fruit yield of tomato from 16.08 to 48.48 %. It can be concluded that all treatments used gave good control of late blight disease in tomato which ultimately gave better yield than the control.

Results of Tables (2 and 3) showed that all treatments significantly reduced the incidence of late blight disease caused by *Phytophthora infestans* and increased tomato fruits yield. These results are in agreement with those obtained previously. For example, mancozeb, propineb and metalaxyl were among fungicides evaluated by Abdul Rasheed & Khan (2008) in controlling *Phytophthora infestans*, the causal fungus of the late blight. The results showed that metalaxyl effectively controlled the late blight disease (lowest disease incidence of 10.66 %), followed by mancozeb (12.68 %), while propineb registered 19.16 % disease incidence. Late blight was successfully controlled by mancozeb, copper oxychloride and metalaxyl (Mustafee *et al*., 2007 and Shailbala & Pundhir, 2008 a). Shailbala & Pundhir (2008 a) suggested that three sprays of mancozeb at 0.20 % or two sprays of metalaxyl at 0.20 % should be applied for the management of late blight. Atia (2005) and El-Shimy & Tomader (2006) reported that propamocarb Hcl gave significantly better control of late blight of potato caused by *Phytophthora infestans* and gave higher marketable yield. Recently, Ahmed (2010) cited that Mancozan 80 % WP (mancozeb), Tridex 80 % WP (mancozeb) and Privicur N (propamocarb Hcl) had a high fungicidal activity against late blight disease. Hariki (2006) evaluated the efficacy of seven fungicides against potato late blight disease.The fungicides tested included four copper – based compounds (copper oxychloride, copper Nordox [copper hydroxide], Kocide [copper hydroxide] and Champion [chloridazon]) and three based on chlorothalonil (Banis, Echo and Barrack). All chlorothalonil products were found to be more effective than the copper products in controlling the disease. Sobolewski *et al* (2009) investigated the efficacy of some fungicides

including mancozeb and chlorothalonil on late blight (caused by *Phytophthora infestans*) incidence and tomato yield. All fungicides showed high efficacy in controlling late blight on tomato grown in field and under cover. Also, Stevenson (2009) reported that mancozeb, cymoxanil, propamocarb Hcl and chlorothalonil reduced the spread of late blight disease.

Our results indicated that the tested mixtures of fungicides were more efficient in controlling late blight than fungicides alone. The results obtained are in agreement with those obtained by many investigators. Gutsche *et al*. (1994) inoculated detached leaves of tomato with *Phytophthora infestans* and treated with mancozeb, mancozeb + cymoxanil, mancozeb + metalaxyl, mancozeb + oxadixyl and Zineb in lab. experiments to assess their protective and curative effects, penetrative ability, duration of efficacy and the effect of rain. Mancozeb + metalaxyl was the most effective fungicide and Zineb was the least effective. Majid *et al*. (1995) found that mancozeb + oxadixyl and mancozeb + metalaxyl controlled *Phytophthora infestans* on tomato in the lab. and in the field in Pakistan. Captan, chlorothalonil and mancozeb were less effective. Bleaser *et al*. (1999) studied the efficacy of mancozeb + propamocarb and mancozeb + metalaxyl against *Phytophthora infestans* on tomato plants under greenhouse conditions. Applications of fungicides decreased disease severity and increased the tomato yield. Tofoli *et al*. (2003) evaluated the effectiveness of various groups of fungicides for controlling early blight as well as their effect on tomato fruit yield. The highest levels of disease control, quality and increase on fruit yields were obtained with pyraclostrobin + metiram, mancozeb + cymoxanil + famoxadone, azoxystrobin, difenoconazole and mancozeb + famoxadone. Mancozeb and chlorothalonil resulted in the lowest levels of control. Chowdhury & Mitra (2006) studied the efficacy of mancozeb, mancozeb + metalaxyl and mancozeb + carbendazim against *Phytophthora infestans* on tomato plants. For the management of the disease by spraying with fungicides, mancozeb + metalaxyl was found to be most effective, followed by mancozeb + carbendazim and mancozeb. These treatments increased the yield significantly over the untreated control, and were found to be economical when the cost benefit ratio was calculated.

Synergistic interaction between fungicides in controlling fungal plant pathogens is a well characterized phenomenon (Samoucha *et al*., 1993 and Gisi 1996). There are three main goals when mixing fungicides: broaden the spectrum of activity, reduce selection of resistant fungal subpopulations, and reduce doses of fungicide application (Gisi 1996). For example, 2- way mixtures of mancozeb + metalaxyl or 3- way mixtures consisting of mancozeb + cymoxanil + metalaxyl were shown to enhance greatly the control of late blight in potato in the greenhouse and the field (Gisi 1996). Such mixtures were also effective in suppressing the increased appearance of metalaxyl-resistant subpopulations in nature (Cohen & Samoucha, 1989).

It is known that the synergistic action is more pronounced when components of the mixture had different modes of action (Gisi 1996).

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تقييم بعض المبيدات الفطرية ومخاليطها في مكافحة مرض الندوة المتأخرة في الطماطم في محافظة الإسماعيلية.

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تم تقييم ثمانية مبيدات فطرية (ترايدكس ٨٠٪ ، ترايدكس٧٥٪، مانكوزان، انتراكول، بريفكيور ان، ريدو كوبر، فاكوميل، كلورثيت) و ستة مخاليط من المبيدات الفطرية (أروميل ام زد، كبروكسات جولد، سيرينو، كيوربلاس، ريدوميل جولد بلس، جالبين نحاس) في محافظة الإسماعيلية خلال موسمين متتالين (صيف ٢٠٠٩ و شتاء ٢٠١٠) ضد مرض الندوة المتأخرة في الطماطم وكذلك تأثير هذه المبيدات على محصول ثمار الطماطم. كل المبيدات طبقت بالمعدلات الموصى بها. معاملة المقارنة سجلت أكبر شدة اصابة بالمرض. كل المعاملات أحدثت نقص معنوي في شدة الاصابة وزيادة معنوية في كمية محصول الثمار مقارنة بمعاملة المقارنة (الكنترول). كانت مخاليط المبيدات أكثر فعالية في مكافحة المرض من المبيدات المستخدمة منفردة. فكانت المبيدات ريدوميل جولد بلس، سيرينو، كبروكسات جولد، أروميل ام زد هي الاكثر فعالية ويليها مبيدات كيوربلاس، جالبين نحاس، كلورثيت، فاكوميل، بريفكيور ان ثم مبيدات المانكوزيب (ترايدكس ٨٠٪ ، ترايدكس٧٥٪، مانكوزان٨٠٪) بينما كانا مبيدى انتراكول، ريدو كوبر هما أقل المبيدات فعالية. وعموماً تطبيق المبيد الفطري كل ١٠ أيام خلال نمو الطماطم يعتبر ضروري لوقاية النباتات من العدوى الطبيعية بمرض الندوة المتأخرة فينتج عن ذلك زيادة في محصول ثمار الطماطم.

قام بتحكيم البحث

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Table (1): List of the used fungicides.

Trade name	Common name or active ingredient	Chemical name (IUPAC)	Rate of application/ 100L.water
Tridex 80% WP	Mancozeb	Manganese ethylene bis (dithiocarbamate) (polymeric) complex with zinc salt	250 g
Tridex 75% DG	Mancozeb	Manganese ethylene bis (dithiocarbamate) (polymeric) complex with zinc salt	200 g
Mancozan 80% WP	Mancozeb	Manganese ethylene bis (dithiocarbamate) (polymeric) complex with zinc salt	250 g
Antracol 70% WP	Propineb	Polymeric zinc 1,2- propylene bis (dithiocarbamate)	300 g
Previcur-N 72.5% SL	Propamocarb HCL	Propyl 3- (dimethylamino) propylcarbamate hydrochloride	250 cm^3
Rido-copper 50% WP	Copper oxychloride	Dicopper chloride trihydroxide (approximate composition) **;** copper oxychloride	150 g
Vacomil 35% WP	Metalaxyl	Methyl N- (methoxyacetyl) -N- (2,6- xylyl) -DL-alaninate**;** methyl 2-{[(2,6-dimethylphenyl) methoxyacetyl] amino} propionate	75 g
Chlorothit 75% WP	Chlorothalonil	Tetrachloroisophthalonitrile	250 g
Aromil-MZ 72% WP	Mancozeb 64% + metalaxyl 8%	Manganese ethylene bis (dithiocarbamate) (polymeric) complex with zinc salt + Methyl N- (methoxyacetyl) -N- (2,6- xylyl) -DL-alaninate**;** methyl 2-{[(2,6- dimethylphenyl) methoxyacetyl] amino} propionate	250 g
Kaproksat-Gold 72% WP	Mancozeb 64% + cymoxanil 8%	Manganese ethylene bis (dithiocarbamate) (polymeric) complex with zinc salt + 1- (2-cyano -2- methoxyiminoacetyl) -3- ethylurea	150 g
Sereno 60% WG	Mancozeb 50% + fenamidone 10%	Manganese ethylene bis (dithiocarbamate) (polymeric) complex with zinc salt + *(S)* -1- aniline -4- methyl -2- methylthio -4- phenylimidazolin -s- one	150 g
Cure-plus 50% WP	Copper oxychloride + metalaxyl	Dicopper chloride trihydroxide (approximate composition) **;** copper oxychloride + methyl N- (methoxyacetyl) -N- (2,6- xylyl) -DL-alaninate**;** methyl 2-{[(2,6- dimethylphenyl) methoxyacetyl] amino} propionate	150 g
Ridomil-Gold-Plus 42.5% WP	Copper oxychloride + mefanoxam	Dicopper chloride trihydroxide (approximate composition) **;** copper oxychloride + methyl N- (methoxyacetyl) -N- (2,6- xylyl) -D-alaninate**;** methyl (R) -2-{[(2,6- dimethylphenyl) methoxyacetyl] amino} propionate	200 g
Galben copper 46% WP	Copper oxychloride 35% + benalaxyl 11%	Dicopper chloride trihydroxide (approximate composition) **;** copper oxychloride + methyl N- phenylacetyl –N-2,6-xylyl –DL- alaninate	250 g