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FIELD AND LABORATORY EVALUATION OF ENVIRONMENTALLY SAFE CHEMICALS AGAINST SOME APHID SPECIES

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Abstract

The commonly used beaking yeast combinations (yeast, molasses, wheat flour and natural oil extracted from soybean plants), petroleum oil fractions (Royal oil, CAPL 1 & CAPL2 & Sisi 6) and some plant extracts (Jojoba oil, Glue & Gum) were evaluated against *Aphis gossypii* (Glover), *A.craccivora* (Koch.), *Myzus persicae* (Sulzer), and the cereal aphids *Schizophis graminum* (Rond.) and the oat cheery bird aphid (*Rhopalosiphum padi* (L.). These treatments were compared in efficiency with some conventional insecticides such as Malathion 57%, Reldan 40%, and Deltanete 40%. Yeast combinations either alone or mixed with natural oil, however, showed no potency as aphicides under lab. or field conditions. Data also, revealed that Jojoba oil (plant extract), CAPL1 & CAPL2 (petroleum oil fractions) exhibited higher effectiveness.

INTRODUCTION

Aphids, these minute piercing and sucking insects are the most important field crop pests in Egypt. The continuos and unwise use of insecticides by farmers usually lead to adverse effects on naturally occurring biological control agents and the biotic environment as well. Because of pollution hazards, a wise strategy has been developed by the Ministry of Agriculture to maximize the role of natural enemies through tne use of safe chemicals including botanical extracts.

However, in the search for environmentally friendly chemical, some had claimed that the yeast *Saccharomyces cerevisiae* is potent against aphids and that its mixtures with flour and molasses could further increase its toxicity. Moreover, irrational reports not based on scientific ground were submitted to the officials stating the feasibility of such products in aphids control, a matter lead to their wide use on cotton during 1994 and 1995 seasons. Although yeasts belong to the unicellu-

lar Ascomycetes, they include 39 genera with approximately 350 species. They are found in a wide range of terrestrial and aquatic habitats in which a suitable carbon source is available (Raven et al., 1986).

The purpose of the present work is to investigate the potency of several environmentally safe chemicals against different species of aphids and one of greenbug insect. The yeast *Saccharomyces cerevisiae* and its mixtures with flour and molasses were tested against aphids, and comparisons were made with recommended aphicides.

MATERIALS AND METHODS

Inscts tested: The tested aphid species were the cotton aphid *Aphis gossypii* (Glover), the cowpea aphid *A.craccivora* (Koch.), the green peach aphid, *Myzus persicae* (Sulzer), and two species of cereal aphids, the oat cheery bird aphid (*Rhopalosiphum padi* (L.), and the greenbug, *Schizophis graminum* (Rond.).

Chemicals used: The aphicides used were Malathion 57%, Reldan 40% and Deltanete 40%. The common yeast for baking was used alone and in mixtures with molasses and wheat flour were added at different rates. A natural oil extracted from soybean plants containing 93% oil and 7% inert materials was used either alone or combined with yeast-molasses mixture at different rates.

Petroleum oil fractions Royal Oil, CAPL1, CAPL2 (1.5%); Sisi 6 (surfactant 1.5%), Jojoba oil, Glue and Gum (Sticker) were also tested on aphids.

Bioassay under laboratory conditions: Detached infested leaves of cotton, wheat and faba bean were immersed in different tested aquatic solutions of yeast for 10 seconds, left to dry for half an hour, then by means of a fine camel hair brush unwinged treated adult aphids were transfer to untreated seedlings of their native plants grown at 10 cm plastic pots, where *A.gossypii* was left on cotton, *A.craccivora* & *M.persicae* on faba bean and *S.graminum* & *R.padi* on wheat seedlings, respectively. Seedlings were left at room temperature for 24 hours. Reduction percentages were calculated according to Henderson and Tilton formula (1955).

Side dip technique was followed by placing adult aphids upside down on double adhesive tape fitted to glass slides and immersed for 10 seconds in different concentrations. Counts of alive/dead aphids were recorded 3 hours after treatment, moribund insects were considered dead.

Aphicidal activity under field conditions

a. Faba bean experiment : Five treatments had been carried out in 1994-1995 season against *A.craccivora* infesting faba bean at Beni Suef and Sakha Experimental Station. The plot size was equivalent to 1/100 feddan. Four replicates were made for each treatment. All treatments were arranged in a complete randomized block design. Normal agricultural practices were carried out regularly. An ordinary Knapsack sprayer of 20 liter capacity with a bent down nozzle was used.

The following treatments were undertaken:

1. Yeast + molasses at 1.5 kg + 1kg/100 liter water.
2. Natural oil + yeast + molasses at 250 ml + 1.5 kg + 1.5 kg/100 liter water.
3. Natural oil + yeast at 250 ml + 1.5 kg 100 liter water.
4. Reldan 40% (aphicide) at 200 ml/100 liter water.
5. natural oil 250 ml/100 liter water.
6. Untreated check.

As for yeast preparations, aquatic solutions were mixed, then left for three hours before application.

Counts of alive aphids were made at first before treatment then 48 hours, 5 days, 8 days, 10 days and two weeks after treatment. The sample size was the number of aphids found on the 5cm from the top of 25 tillers taken randomly out of 25 plants from each plot selected. This amounted to 100 tiller taken from each treatment. Reduction percentages were calculated according to Henderson and Tilton's formula (1955).

b. Cotton experiment : Yeast combinations were assessed on cotton at late 1995 at Sakha Experimental Station. The treatments were as follows:

1. 1.5 kg yeast + 1kg flour + 1 kg molasses/100 liter water.
2. Deltanete 40% at the rate of 75 ml/100 l water.

The plot size was 42 m2. Treatments were replicated four times. Normal agricultural practices were undertaken. Spraying was carried out by an ordinary knapsack sprayer with a bent down nozzle. Sample size was the number of aphids found on 25 leaf/plot, i.e. 100 leaves for each treatment.

c. Wheat experiments : Petroleum oil fractions CAPL1 and CAPL2 at 1.5%,

Sisi 6, 1.5% (surfactant), Jojoba (extracted from Jojoba plant), Glue, Gum (Stickers), and Malathion 57% were applied on wheat plants against the oat cherry bird aphid, *R.padi*. Plants treated with water only served as control. This experiment was conducted at Kafr El-Sheikh (Sakha Experimental Station), El-Sharkia and Beni Suef Governorates.

Because of the different nature of the materials used, care was taken for covering the plants completely with the tested formulations. Spraying was carried out prior to flowering time. Treatments were arranged in a randomized block design with four replicates. Samples size was number of alive aphids found on 25 tillers/ plot. Counts of aphid were recorded at first before treatment and 48 hours, 5 days, 8 days and 11 days after treatment. Observation of any sort of phytotoxicity was considered.

RESULTS AND DISCUSSION

As shown in Table 1 when the infested detached leaves of wheat, faba bean and cotton were immersed in the two yeast formulations, no apparent reduction percentage were occurred 24 hours after treatment. The treated aphids, however, seemed to be more active, and larger in size than the untreated ones.

As for slide-dip technique, data in Table 2 indicate that the two yeast formulations did not produce any reduction percentages on the 3 aphid species. The natural oil produced poor results when either used alone or combined with the two yeast formulations. However, the standard aphicide Reldan showed the highest percentages of reduction being 99, 98 and 100 for *A.craccivora, A.gossypii* and *S.graminum*, respectively.

The effectiveness of the same products was also explored under field conditions on *A.craccivora* infesting faba bean plants at Beni-Suef Governorate, Table 3. The yeast formulation produced 0% reduction after 11 days from treatment. Natural oil combined with the two yeast formulations showed 24.94 and 12.32% reductions, respectively, indicating poor effectiveness. The potency of the natural oil alone was also low reaching 18.46 reduction. Reldan was the only potent chemical exhibiting 98.95, 91.90, 64.31 and 29.26% reduction after 2,5,8 and 11 days from treatment, respectively. The mean residual effect percentage was satisfactory reaching 61.82%.

Table 1. Aphicidal activity of two yeast formulations in comparison with conventional aphicides.

Treatment	Formulation and Dosage /100 liter water	Reduction % 24 hours after treatment				
		A.gossypii	*R.padi*	*S.graminum*	A.craccivora	M.persicae
Yeast	1.5kg Y+1Kg flour+ 1 kg Molasses	0.0	0.0	0.0	0.0	0.0
Yeast 2	1.5 kgY + 1 kg Molasses	0.0	0.0	0.0	0.0	0.0
Malathion 57	75 ml	100.0	100.0	100.0	100.0	100.0
Deltanet 40	75 ml	100.0	100.0	100.0	100.0	100.0

Table 2. Reduction percentages of three aphid species exposed to yeast formulation either alone or combined with a natural oil (slide dip technique).

Treatment and formulation / 100 liter water	Aphid species	No. of aphids in the untreated check		No. of aphids after treatment		Reduction %
		Before	After	Alive	Dead	
1.5kg yeast+1kg molasses+1kg flour	*Aphis craccivora*	100	0	100	0	0
	A.gossypii	100	0	100	0	0
	S.graminaum	100	0	100	0	0
3kg yeast+2kg molasses+2kg flour	*Aphis craccivora*	100	0	100	0	0
	A.gossypii	100	0	100	0	0
	S.graminum	100	0	100	0	0
250ml Natural oil	*Aphis craccivora*	100	0	47	53	53
	A.gossypii	100	0	56	44	44
	S.graminum	100	0	63	37	37
250 ml Natural oil + 1/2 kg yeast	*Aphis craccivora*	100	0	60	40	40
	A.gossypii	100	0	58	42	42
	S.graminum	100	0	60	40	40
250 ml Natural oil + 1/2 kg yeast + 1/2 kg molasses	*Aphis craccivora*	100	0	54	46	46
	A.gossypii	100	0	60	40	40
	S.graminum	100	0	65	35	35
200 ml Reldan	*Aphis craccivora*	100	0	1	99	99
	A.gossypii	100	0	2	98	98
	S.graminum	100	0	0	100	100

Table 4 shows that yeast combinations with molasses or natural oil did not produce satisfactory reduction percentages. This was evident at the levels of initial kill and residual effect as well. The toxicity of the natural oil alone somewhat improved in this experiment being 57.44, 61.63, 62.02, 71.42 and 82.71 reduction percentages after 2,5,8,11 and 14 days, respectively. The mean percentage of residual effect did not exceed 69.45. Reldan, however, showed levels of reduction ranging from 100 to 99.68 along the experimental period. In this connection, it is noteworthy to indicate that some leaf burns were observed in the treatments in which yeast formulations were used. The burns began to appear 2 days after treatment then steadily increased thereafter.

Table 3. Reduction percentages of A.craccivora treated with yeast formulation, natural oil and their combinations under field conditions (Beni-Suef Governorate)

Treatment and formulation / 100 liter water	No. of aphids before treatment	Number of aphids and reduction percentage				Mean residual effect %
		2days	5 days	8 days	11 days	
Yeast + molasses (1.5 kg +1.kg)	6165	7725 0.0%	8400 0.0%	7780 0.0%	11040 0.0%	0.0
Nat oil + yeast + molasses (250ml+1.5kg+1.5kg)	7230	4980 35.39	5220 36.55	6515 17.81	6378 20.45	24.94
Nat oil +yeast (250ml+1.5 kg)	7155	5381 36.46	6615 18.75	7025 10.39	7315 7.81	12.32
200 ml Reldan 40%	6510	109 98.95	600 91.90	2547 64.31	51.07 29.326	61.82
250 Natural oil	6683	4478 37.15	5633 25.92	5745 21.58	6820 7.98	18.46
Untreated	6930	7388	7885	7597	7685	

At a late stage of cotton growth the mixture yeast + flour + molasses was further applied on the cotton aphid *A.craccivora* Table 5. As compared with the standard aphicide Deltanet which showed 98.6% mean reduction percentage, the corresponding value for the yeast mixture with flour and molasses was only 12.13%.

Reduction percentages of some candidates tested on the oat cherry bird aphid, *R.padi*, infesting wheat plants are shown in Table 6. Results demonstrated in Table 6

showed that the petroleum oil fractions CAPL1 and CAPL2 at the rate of 1.5% gave initial reductions of 74.5 and 91.5, respectively. The surfactant Sisi 6 gave 68.1% reduction. Jojopa as a crude oil showed 70.5% reduction and 73.2% as an emulsifiable concentrate. Gum and glue, however, were very poor suppressors as shown by 17 and 16.6% reductions, respectively.

Table 4. Reduction percentages of *A.craccivora* infesting faba bean in Kafr El-Sheikh Governorate (Sakha Experimental Station).

Treatment and formulation / 100 liter water	No. of aphids before treatment	Number of aphids and reduction percentage					Reduction %
		2days	5 days	8 days	11 days	14 days	
Yeast + molasses (1.5 kg +1.kg)	235	217 2.8	314 4.9	297 3.15	358 6.66	428 3.48	0.59
Nat oil + yeast (250ml+1.5kg)	216	240 16.96	243 19.93	253 10.25	258 15.59	298 21.61	16.85
Nat oil +yeast+ molasses (250ml+1.5 kg+1.5kg)	224	230 8.08	294 6.58	260 11.06	275 13.24	349 11.48	10.59
250 Natural oil	230	93 57.44	124 61.63	114 62.02	93 71.42	70 82.71	69.45
200 ml. Reldan 40%	176	0 100.00	0 100.0	0.5 99.78	0.8 99.68	4 98.71	99.54
Untreated	200	190	280	261	283	352	

Table 5. Reduction percentages and mean residual effect of yeast mixture with flour and molasses in comparison with Deltanet on *A.gossypii* infesting cotton.

Treatment and formulation / 100 liter water	No. of aphids before treatment	Number of aphids and reduction percentage				Reduction %
		2days	5 days	8 days	11 days	
75 ml Deltanet 40%	37	1 98.7%	1 98.99%	2 97.83%	2 98.88%	98.6
Yeast + flour + molasses (1.5kg+1kg + 1kg)	33	52.00 23.18%	70.20 20.10%	93.00 13.10	165.00 3.2%	12.13
Control	39	80	105.00	97.20	189.00	

With regard to the mean residual effect of the tested compounds, could be arranged in the following descending order. Malathion, CAPL2, Jojoba oil EC, Sisi 6, CAPL1, Jojoba crude oil, glue and the arabic gum. The corresponding values of the mean reduction percentage were 98.5, 95.5, 95.2, 89.6, 88.8, 20.6 and 4.2 Plots receiving water treatment showed 13.2 and 12.8% initial reduction and residual effect, respectively.

Table 6. Reduction percentages of some safer chemicals tested against the wheat aphid *R.padi* in Kafr El-Sheikh Governorate.

Treatment and formulation / 100 liter water		No. of aphids before treatment	Number of aphids and reduction percentage				Reduction %
			2days	5 days	8 days	11 days	
CAPL 1	(1.5%)	420	113	89	53	20	89.6
			74.5%	86.6%	89.6%	92.7%	
CAPL 2	(1.5%)	390	35	29	21	11	95.5
			91.5%	95.3%	95.6%	95.7%	
Sisi 6	(1.5%)	390	131	50	26	10	94.2
			68.1%	91.9%	94.5%	96.1%	
Jojoba EC	(1.25%)	410	116	44	21	9	95.2
			73.2%	93.2%	95.8%	96.6%	
Jojoba crude oil	(1.5%)	470	146	147	50	16	88.8
			70.5%	80.2%	91.3%	94.8%	
Gum	(1.5%)	560	490	860	610	370	4.2
			17.0%	2.9%	10.6%	0.0%	
Glue	(1.5%)	750	660	950	720	390	20.6
			16.6%	19.9%	21.2%	20.6%	
Malathion	(1.5/1000)	550	2	11	10	6	98.5
			99.7%	98.7%	98.5%	98.3%	
Water treatment		590	540	790	620	350	12.8
			13.2%	15.4%	13.7%	9.4%	
Control		550	580	870	670	360	

Except of CAPL2 which was replaced by Royal oil, the same experiment was conducted on *R.padi* infesting wheat in Beni-Suef Governorate, Table 7. Based on the reduction percentages of these compounds, they could be arranged descendingly as follows: Royal oil, Malathion, Jojoba oil, Malathion, Jojoba oil EC, CAPL1, Sisi 6, glue and gum. The corresponding values of percentages of initial reduction and residual effect (in brackets) were : 98.9 (98.1), 98.6 (99.4), 66.1 (72.5), 65.0 (72.9), 57.8 (58.8), 38.5 (48.9) and 19.7 (12.6), respectively. Another experiment was conducted at Sharkia Governorate using CAPL1, Jojoba oil in crude and EC forms and Malathion as a standard aphicide, Table 8.

Table 7. Reduction percentages of some safer chemicals tested against the wheat aphid *R.padi* in Kafr El-Sheikh Governorate.

Treatment and formulation / 100 liter water		No. of aphids before treatment	Number of aphids and reduction percentage				Reduction %
			2days	5 days	8 days	11 days	
Royal 1	(1500 ml)	3180	32	79	55	43	98.1
			98.9%	94.4%	98.2%	98..6%	
CAPL1	(1500 ml)	3277	1131	475	850	1330	72.9
			65.0%	84.9%	73.8%	59.9%	
Glue	(1500 ml)	1910	1164	910	985	1015	48.9
			38.5%	50.8%	84.2%	47.7%	
Gum	(1500 ml)	2220	1761	1847	1930	1994	12.6
			19.7%	13.9%	12.4%	11.4%	
Jojoba EC	(1500 ml)	3055	1022	969	885	631	72.5
			66.1%	67.2%	70.8%	79.6%	
Sisi 6	(1250 ml)	2675	1115	895	1025	1368	58.8
			57.8%	65.4%	61.4%	49.5%	
Malathion	(150 ml)	3265	46	34	28	21	99.4
			98.6%	98.9%	99.9%	99.3%	
Control		3320	3280	3208	3295	3365	

As indicated in Table 8, Jojoba crude was the most potent oil with 88.8% residual effect followed by Malathion (88.5%), Jojoba EC (82.9) and CAPL1 (73.5%). The corresponding initial kill percentage were 95.4, 85.9, 80.0 and 75.6% for Malathion, Jojoba crude oil, Jojoba EC and CAPL1, respectively.

Some pathogenic fungi were isolated from aphids, *Bauveria bassiana* was one of these. It was found pathogenic to six species of cereal aphids including the Russian wheat aphid. *Diuraphis noxia* and the greenbug, *S.graminum* (Feng et al., 1990). Knudsen et al. (1990) stated that *Bauveria bassiana* (Balsamo), is an important insect pathogen that infects a wide array of insect hosts. However, its use in agricultural pest control has been limited due to, in part, because of the existence of several factors that are capable of limiting the effectiveness of fungal pathogens. Among these are difficulties in preparing and applying fungal formulations, short storage life, short life on plant surface, and the requirement of high relative humidity for a prolonged period to start conidial germination (Ferron, 1978 and 1981).

Some researchers observed a sort of antagonistic effect of 586 strains of natural wine yeasts belonging to different genera. Among the antagonists, two strains of Saccharomyces cerevisia showed a broad spactrum of antagonistic effect against 10 fungal pathogens. However, the strains of yeast if it assumed that they

Table 8. Reduction percentages of some safer chemicals tested against the wheat aphid *R.padi* in Sharkia Governorate.

Treatment and formulation / 100 liter water		No. of aphids before treatment	Number of aphids and reduction percentage				Reduction %
			2days	5 days	8 days	11 days	
CAPL1	(1500 ml)	721	260	259	485	564	73.5
			75.6%	80.6%	69.6%	70.1%	
Jojoba crude oil	(1500 ml)	754	147	126	131	285	88.8
			85.9%	90.3%	91.6%	84.5%	
Jojoba EC	(1250 ml)	990	274	240	286	566	82.9
			80.0%	86.0%	86.1%	76.6%	
Malathion EC	(150 ml)	886	56	64	209	411	88.5
			95.4%	95.8%	88.6%	81.0%	
Control		797	1103	1383	1653	1950	

would be pathogenic to aphids, this could be only through sporulation of conidia formation. Eventhough, killing by sporulation needs from 9-15 days to act effectively. Furthermore, high relative humidity amounting to approximately 100% is also needed.

Feng et al. (1990) identified several species of hyphomycetous fungi infesting cereal aphids, and documented the role of fungi as natural enemies of aphids.

Vandenberg (1996) experimented two hyphomycetous fungi with potential as biocontrol agents in bioassays against the Russian wheat aphid, *Diuraphis noxia*. Dose-response assays were done using 5-7 concentrations of 2 isolates each of *Beauveria bassioana* (Balsamo) and *Paecilomyces fumosoroseus*.

The used yeast in the current works is the normal baking yeast, *Saccharomyces cerevisiae* which is far from being pathogenic to aphids. It is generally used in media preparations for insects and some aphid species. The experiments reported herein showed no or very poor effect on aphids under laboratory and field conditions. On the contrary, in some plots treated with yeast, aphid numbers seemed to be higher than in the control.

Jojoba oil in the form of crude and emulsifiable concentrate, as well as the petroleum fraction oil CAPL1 and CAPL2 proved to be good aphicides under laboratory and field conditions.

Jojoba leaf extracts are now known to have antimicrobial and antinematodal effects (Abd El-Aziz et al., 1996). Significant antibacterial effect was observed

against *Bacillus cereus, B.subtilus, Staphylococcus aureus* and *Proteus mirabilis*. Extensive scanning and transmission electron microscopy studies revealed structural degeneration and morphological alteration beyond refair in *S.aureus*.

The unique oxidative stability of Jojoba oil, the fact that it is a natural biodegradable, non-petroleum based renewable resource, and the expected positive user response to products containing Jojoba, are reasons for its use in integrated pest control programs.

Sine these new candidates do not protect the newly developed plant growths, they should be manipulated as to help the plants escape new aphid infestation.

REFERENCES

1 . Abd El-Aziz, Z.A., I. Darah, H.Y. Leong, C.O. Ibrahim and I. Noraini. 1996. Jojoba leaf extracts: Potential as antimicrobial and antinematode agents. 145-149. In Proceedings of the Ninth International Conference on Jojoba and its Uses and of the Third International Conference on New Industrial Crops and Products. Edited by Lambertus H.Princen and Carlos Rossi.

2 . Feng, M.G, J.B. Johnson and L.P. Kish. 1990. Virulence of *Verticillium lecanii* and an aphid derived isolate of *Beauveria bassiana* (Fungi. Hyphomycetes) for six species of cereal-infesting aphids (Homoptera : Aphididae). Evniron. Entomol., 19: 815-820 .

3 . Ferron, P. 1978. Biological control of insect pests by entomopathogenic fungi. Annu. Rev. Entomol., 23: 409-442.

4 . Ferron, P. 1981. Pest control by the fungi Beauveria and Metarrhum. pp. 465-482. In H.D. Burges (Ed.). Microbial Control of pests and Plant Diseases. 1970-1980. Academic, New York.

5 . Henderson, C.F. and E.W. Tilton. 1955. Tested with acaricides against the brown wheat mite. J. Econ. Entoml. 48: 157-161.

6 . Knudsen, G.R., J.B. Johnson and D.J. Eschen. 1990. Alginate pellet formulation of *Beauveria bassiana* (Fungi. Hyphomycetes) Isolate pathogenic to cereal aphids. J. of Economic Entomology, 83, (6): 2225-2288.

7. Raven, P.H., R.F. Ever and S.E. Eichorn. 1986. Biology of Plants. Fourth Edition, text Book, Worth Publishers, Inc., New York, 775 p., 1986.

8. Vandenberg, J.D. 1996. Standardized bioassay and screening of *Beauveria bassiana* and *Paecilomyces fumosoroseus* against the Russian wheat aphid (Hamoptera: Aphididoe). J. of Economic Entomology, 89, (6) : 1418:1423.

تقييم معملى وحقلى لكيماويات آمنة بيئياً على بعض أنواع المنّ

مجدى عبد الحميد الحريرى ، إبراهيم على مرزوق ، رمضان بهى الدين ،
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معهد بحوث وقاية النباتات - مركز البحوث الزراعية - الدقى .

يهدف هذا البحث الى الوصول الى مركبات آمنة بيئياً من مصادر طبيعية فعالة ضد حشرات المن بالإضافة إلى تقييم فاعلية مادة الخميرة والتى أدعى البعض فاعليتها فى مكافحة المنّ مما أدى إلى إستخدامها على نطاق واسع على القطن فى موسمى ١٩٩٤ ، ١٩٩٥ .

يمكن تلخيص النتائج التى أسفرت عنها الدراسة فيما يلى :-

دلت النتائج المتحصل عليها سواء أجريت التجارب معملياً أو حقلياً أن مادة الخميرة سواء إستخدمت منفردة أو مخلوطة بالعسل والدقيق وبالمعدلات والطويقة التى سبق التوصية بها وتم بالفعل تطبيقها على نطاق واسع لم تعطى أية إبادة فعلية لحشرة المن يمكن الإعتماد عليها كأحد وسائل مكافحة الحشرة.

بالنسبة لمادتى الغراء والصمغ العربى فقد أثبتت النتائج عدم فعاليتهما ضد حشرات المن.

أثبتت المشتقات البترولية (كابل ١ ، و كابل ٢) والمواد النشطة سطحياً (سيسى ٦) أن فعاليتها متوسطة بالمقارنة بالمبيدات تحت التجربة.

بالنسبة للمشتقات النباتية (زيت الچوچوبا والزيت المشتق من فول الصويا) فقد أعطت نسب إبادة مشجعة يمكن ترشيحها كمواد تستخدم مستقبلا فى مكافحة حشرات المن.