Effect of olive residue (fitura) extract on the mortality and hatching of certain plant parasitic nematodes

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ABSTRACT

The mortality of juveniles of *Meloidogyne javanica* and *Tylenchulus semipenetrans* and adults of *Xiphinema italiae* and *Tylenchorhynchus goffarti* and hatching of *M. javanica eggs,* in olive residue extract was studied. With an increase in concentration and exposure time, the percent mortality of all nematodes tested was 100% in standard solution (S). In S/2 (50% dilution), the mortality of *X. italiae* and *T. semipenetrans* was also 100% but for *M. javanica* and *T. goffarti*, it was 92% and 71.2%, respectively. Juveniles hatching of *M. javanica* was found to be inhibited at different concentrations of the extract (i.e. S, S/2, S/5, S/10, S/20, S/50 and S/100) compared to control (Distilled water). It was found that standard solution (S) after 24 hours completely suppressed hatching, while few juveniles emerged after 48, 72 and 96 hours of exposure.

INTRODUCTION

Different plant parts have been proved to have some chemicals which are nematicidal in action such as root exudates of *Tagetes erecta, T. patura* and *Asparagus officilanlis* (11, 13), leaf extract of Indian aloe and margosa, flower extract of *Cuscuta* sp. (6) and seed extract of limabean (1). There may be a possibility of presence of some toxic chemical in the olive residue (fruit residue which is left after extraction of the oil).

The efficacy of organic material for the control of plant parasitic nematodes has been tested on different crops (4, 7, 9, 10). Water extract of oil-cakes have also been found toxic to nematodes (3, 12). However, information about the effect of olive residue against nematodes is laking. Therefore, it was considered desirable to study the effect of water extract of olive residue on the mortality of juveniles of *Meloidogyne javanica* and *Tylenchulus semipenetrans* and adults of *Tylenchorhynchus goffarti* and *Xiphinema italiae* and on the emergence of juveniles of *M. javanica*.

MATERIALS AND METHODS

The extract was prepared by soaking 50 gm of olive residue (fruit residue left after the extraction of the oil) in 200 ml of distilled water for 72 hours and filtered through filter paper. The filtrate obtained was arbitrarily termed as standard solution (S). Different dilutions i.e. S/2, S/5, S/10, S/20, S/50 and S/100 were prepared from the standard solution by adding the required amount of nematode suspension in distilled water containing 100 juveniles of *M. javanica* and *T. semipenetrans* and adults of *T. goffarti*

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and *X. italiae* in each petridish separately. In the standard solution, hand picked nematodes were added. For the hatching experiment, 10 egg masses of *M. javanica* were added to each solution in petridishes and kept at room temperature (28°C ±2). Nematodes and egg masses suspended in distilled water only, served as control. There were three replicates for each treatment and for each time interval. Observations were made after 24, 48, 72 and 96 hours and the number of immobilized nematodes was counted. In the experiment dealing with juvenile hatching, the counting of cumulative juvenile's hatch was done after 24, 48, 72 and 96 hours. Mean percentage mortality of nematodes was calculated and data were analysed statistically.

RESULTS AND DISCUSSION

The results show that there is a linear relationship between the concentration of the extract and the percentage mortality of nematodes (Fig. 1 & 2). With the increase in concentration, the percent mortality of different nematodes was increased and it was 100% for all nematodes in the standard solution (S) within 24 hours of exposure. Hundred percent mortality was also observed in S/2 dilution for *X. italiae* and *T. semipenetrans*, while for *M. javanica* it was 92% which reached 100% after 48 hours and for *T. goffarti* it was 71.2% which reached 100% after 96 hours of exposure. As the esposure time was extended, the percent mortality of all nematodes was increased at all concentrations. After 96 hours, the percent mortality of *T. semipenetrans*, *M. javanica*, *T. goffarti* and *X. italiae* was 49.2%, 44.2%, 42.0% and 14.2% respectively even at S/100 dilution. In general, *T. goffarti* was affected most at all concentrations and duration of exposure followed by *T. semipenetrans*, *M. javanica* and *X. italiae*.

The results presented in Table 1 show that there is a gradual increase in juveniles hatching of *M. javanica* with an increase in dilution of the extract and exposure time as compared to the untreated one. The differences in the juvenile hatch at all the concentrations were statistically significant from the control at all time intervals. The differences among different concentrations were also significant except between S/10 and S/20. The hatching was completely suppressed in standard solution (S) after 24 hours while few juveniles emerged after 48, 72 and 96 hours of exposure.

Many chemical compounds such as fatty acids (8, 14), phenolics (5) and amino acids like arginine, tryptophan and valine (1) which are known to occur in plants have been proved toxic to nematodes. According to Clark *et al.* (2) the amino acids are not toxic themselves but may form complexes with other chemicals like amino acid-chlorogenic acid complex or phenolic glucosides which are toxic to micro-organisms. The mortality of nematodes and suppression of juvenile hatching in different concentrations of olive residue extract tested here can be attributed possibly to (i) the presence of some of these inhibiting substrances, (ii) formation of some complex compound from amino acids or (iii) release of some toxic chemical during decomposition. Therefore, pre-plant application of olive residue in soil may possibly be useful in controlling the nematodes in addition to its manural value.

ACKNOWLEDGEMENTS

The authors are indebted to Mr. Abdul Hamid Naji, Head, Section of Plant Protection, Secretariat of Agriculture, Tripoli for providing necessary facilities and to Dr Ezarug Ahmad Edongali, Department of Plant Protection, Faculty of Agriculture, Alfath University for going through the manuscript and valuable comments.

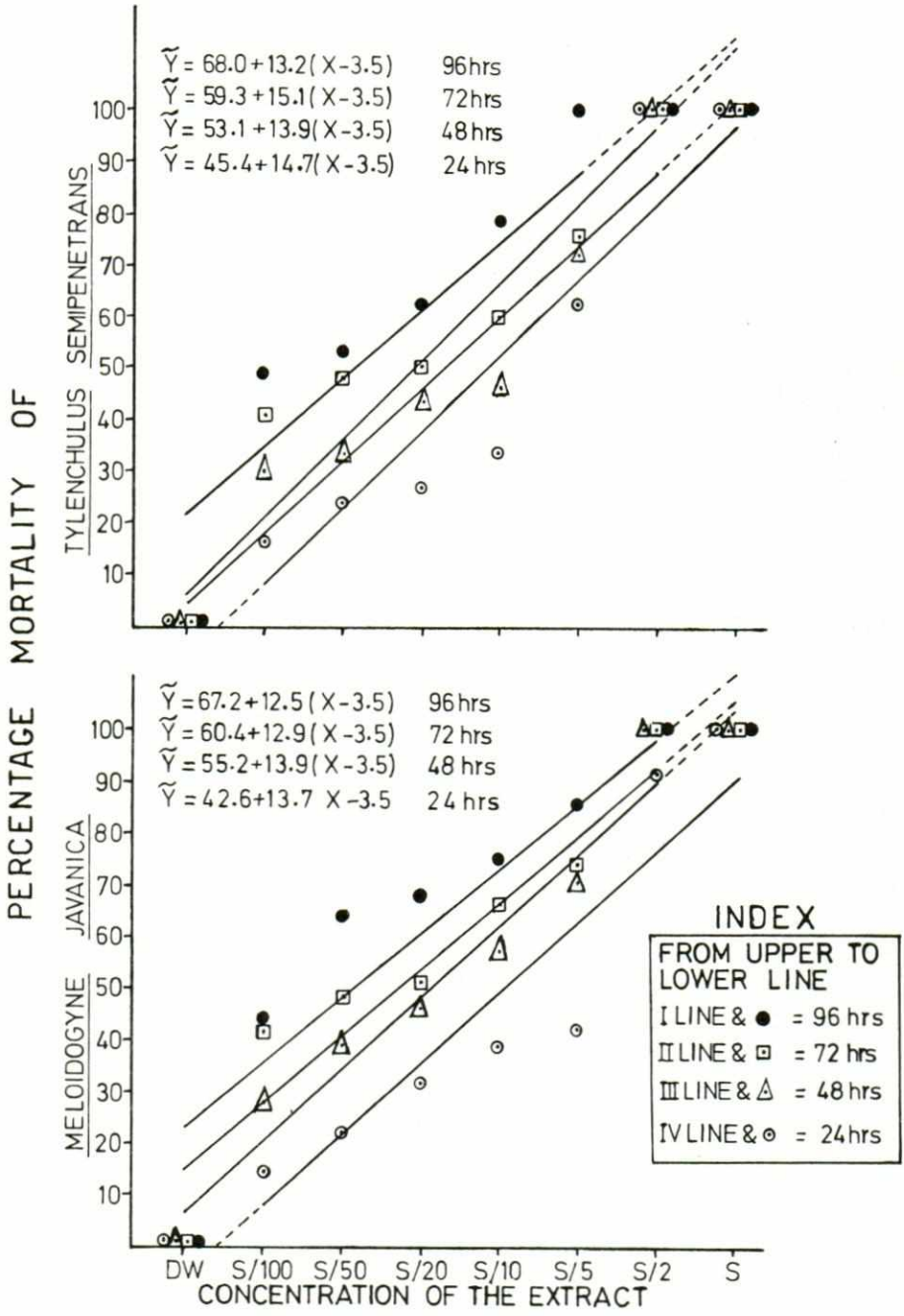

Fig. 1 — *Regression lines showing linear relationship between concentration of the extract and mortality of nematodes.*

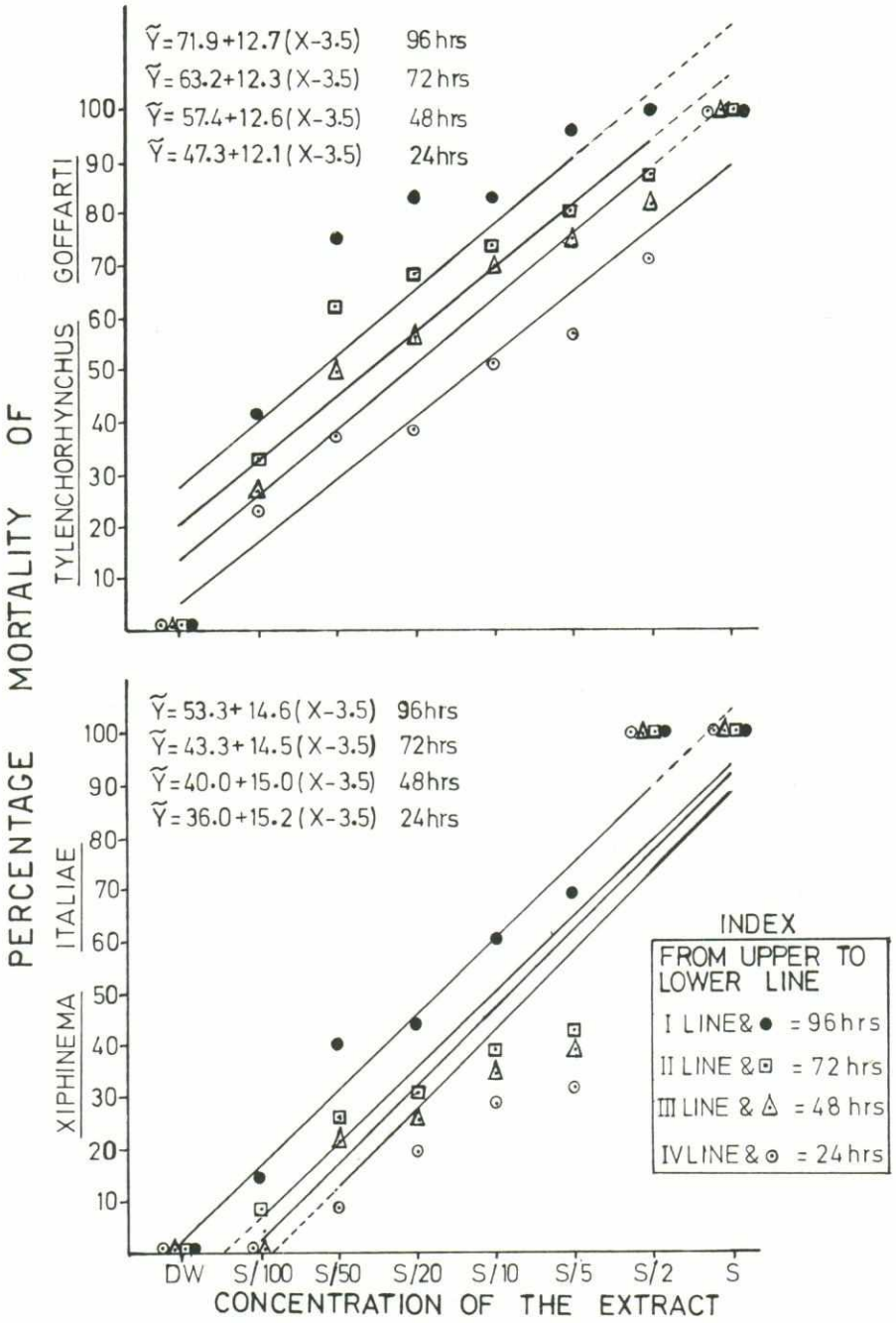

Fig. 2 — *Regression lines showing linear relationship between concentration of the extract and mortality of nematodes.*

Table 1 — Cumulative juvenile hatch of *Meoidogyne javanica* in different concentrations of olive residue extract

Time (hrs)	Concentration of the extract								L.S.D.
	Distilled water	S/100	S/50	S/20	S/10	S/5	S/2	S	5%
24	308	257	210	210	202	176	49	0	30.43
48	529	454	380	315	303	200	86	2	48.23
72	930	808	714	692	511	382	134	11	54.43
96	1125	1002	990	967	902	590	318	65	92.61

Each figure is an average of three replicates.

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تأثير مخلفات عصر الزيتون (الفيتورا) على فقس وموت بعض النيماتودا المتطفلة على النبات

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المستخلص

درس تأثير مخلفات عصر الزيتون (الفيتورا) فى القضاء على الأطوار غير البالغة لكل من نيماتودا تعقد الجذور *Meloidogyne javanica* ، ونيماتودا الحمضيات *Tylenchulus semipenetrans* ، والطور الكامل للنيماتودا الخنجرية *Xiphinema italiae* ، ونيماتودا التقزم *Tylenchorhynchus goffarti* ، كما شملت الدراسة أيضا تأثير هذه المخلفات على فقس بيض نيماتودا تعقد الجذور *Meloidogyne javanica* ، ولوحظ أن نسبة موت النيماتودا ترتفع تبعا لزيادة تركيز محاليل هذه المخلفات ومدة المعاملة بها، حيث وجد أن نسبة الموت فى جميع أنواع النيماتودا المدروسة قد وصلت الى 100% بعد 24 ساعة وذلك فى المحلول القياسى (س) أما فى المحلول نصف القياسى $\frac{س}{2}$ (50% تخفيف) فإن نسبة موت النيماتودا الخنجرية *X. italiae* ، ونيماتودا الحمضيات *T. semipenetrans* كانت أيضا 100% بينما فى حالتى نيماتودا تعقد الجذور *M. javanica* ونيماتودا التقزم *T. goffarti* ، كانت 92% و 71,2% على التوالى.

ولوحظ أيضا أن فقس البيض قد توقف فى جميع التركيزات المختلفة قياسا بالمقارنة (الماء المقطر) $(س \text{ و } — \frac{س}{2} \text{ و } — \frac{س}{5} \text{ و } — \frac{س}{10} \text{ و } — \frac{س}{20} \text{ و } — \frac{س}{50} \text{ و } — \frac{س}{100})$

ووجد أن المحلول القياسى (س) قد أوقف فقس البيض بكامله بعد 24 ساعة الا أن عددا قليلا من البيض قد فقس بعد 48 و 72 و 96 ساعة من المعاملة.