

Aspergillus amstelodami

(2010 / 8 / 16 2010 / 6 / 20)

(30 25 20 15 10) (sublethal)

Aspergillus (Thymol ³ /) (8-Azaadenine)
amstelodami

()

³ / (30 25)

:

Mutagenic Effect of Thymol in Conidia of the Fungus *Aspergillus amstelodami*

Gehaan M. Al-Rawi

Maha A. Al-Rijabo

Department of Biology

College of Science

Mosul University

ABSTRACT

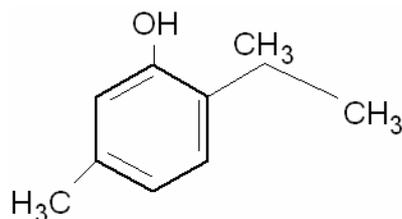
In the present research, five different sublethal concentrations (10, 15, 20, 25, 30) $\mu\text{g}/\text{cm}^3$ of thymol were tested for their ability to induce forward mutation resistant to the

toxic base analogue (8-Azaadnine) in conidia of *Aspergillus amstelodami* by the growth-mediated method.

All five concentrations showed mutant frequencies significantly higher than the spontaneous one, (the negative control). but significance of the mutagenic effect was found in the last two concentrations (25, 30) $\mu\text{g}/\text{cm}^3$.

Keywords: Mutagenicity, *Aspergillus amstelodami*, Thymol.

Thymol (2004)
 (Panizzi *et al.*, 1993) *Thymus Vulgaris*
 (Koruluoglu *et al.*, 2009) *Origanum onites* (Federal, 2003) Eucalyptus
 alcohol Crystals Ether
 $\text{C}_{10}\text{H}_{14}\text{O}$ (Elodie *et al.*, 2009)



(Bruneton, 1999)

(Talei and Meshkatalasadat, 2007 ; Domenico *et al.*, 2005)

(Sokovic *et al.*, 2009 ; Liu *et al.*, 2009 ; Ameziane *et al.*, 2007)

(Liolios *et al.*, 2009 ; Braga *et al.*, 2007 ; Federal, 2003)

.....

Efrat

E.coli

(2007) Roni

(Sebile and Eyyup, 2008)

(Ames, 1975)

.(Hart and Jones, 2005)

(Carcinogens)

(Mutagens)

.(Sugimura, 2000)

Aspergillus amstelodami

.(Jinks and Croft, 1971)

Aspergillus amstelodami

A₁(WA₁)

.(Caten, 1979)

:

Caten (1979)

.

Minimal medium

Malt extract- salt medium

:8-Azaadnine

•

Fluka

(Adnine)

(Dhahi, 1978) ³ /

10

Aspergillus amstelodami

³ /

5000

³ /

50

:Thymol

•

()

1000

.(2004)

.D.M.S.O ³ 50 Thymol 0.05 ³ /

20 ° 63-62

(Heamocytometer) A_1 (CMTS) $\cdot (1999) ^3 / 10^7$

(8-AZA) 8-Azaadnine
(1999)

(MIC)

Thymol

A.amstelodami

°30

Thymol

(M)

(Control)

()

:

$$100 \times \frac{- ()}{()} =$$

Thymol

/ (30 25 20 15 10) : Thymol

.(Azevedok, 1970)

.....

Thymol
(Negative control)

(MD) *A. amstelodami* A₁
(AZA) Thymol Thymol
(Sugimora *et al.*, 1977)

		MD + AZA	³ 0.5	10 ⁰
³ 0.1			10 ⁻⁵	10 ⁰
° 30			.MD	10 ⁻⁵

Thymol
Standard Error (SE)
%1 t(2+2) (t)

(Steel and Torrie, 1980)

A.amstelodami
³ / 60

(1980) Brusick

(1)

A.amstelodami

%100 ³ / 5 %11.0

D.M.S.O ³ / 60

A. amstelodami () : 1

.(point inoculation) Thymol

		()				³ /
		R4	R3	R2	R1	
	2.1	2.5	1.5	2	2.4	0
11.0	1.87	1.8	1.9	2	1.8	5
14.3	1.8	2	2	2	1.2	10
25.23	1.57	1	1.9	1.5	1.9	15
40.5	1.25	1.3	1.3	1.3	1.1	20
56.2	0.92	0.9	0.7	0.9	1.2	25
65.71	0.72	0.5	0.6	0.8	1	30
75.23	0.57	0.1	0.6	0.7	0.9	35
85.7	0.3	0.1	0.1	0.4	0.6	40
85.7	0.3	zero	0.2	0.4	0.6	45
84.8	0.32	0.4	0.2	0.1	0.6	50
87.14	0.27	zero	zero	0.5	0.6	55
100	0.0	zero	zero	zero	zero	60

³ / 60

.(Razzaghi, *et al.*, 2008 ; Liu, *et al.*, 2009) *A. amstelodami*

15 10

(Sublethal)

³ / 30 25 20

Ames McCann

(1989) Babudri and Politi

A. amstelodami

(Toxic level)

(1978)

.DNA

(2)

()

$10^{-7} \times$ 8-Azaadenine $10^7 \times$: 2
A. amstelodami A1
 Thymol

R3			R2			R1			/) (³)
1.66	42	25.20	1.86	50	26.85	1.78	48	27.00	0
2.68	47	17.48	2.97	58	19.50	2.95	54	18.30	10
4.15	43	10.35	4.28	75	17.50	3.72	62	16.65	15
6.00	63	10.50	5.80	87	15.00	5.06	78	15.39	20
7.25	87	12.00	7.40	102	13.78	7.52	95	12.62	25
9.86	106	10.75	9.82	110	11.20	9.87	115	11.64	30
17.45	200	11.46	18.74	125	6.67	17.45	200	11.46	HNO ₂

$10^{-7} \times 1.76$ () (3)

10

$10^{-7} \times (9.85 \quad 7.39 \quad 5.62 \quad 4.05 \quad 2.86) :$ ³ / 30 25 20 15

(2007) Mezzoug *A. amstelodami*

Ioannis *et al.*,) DNA

G,C (1998

.(Aydin *et al.*, 2005) DNA

A. amstelodami

$10^{-7} \times$: 3

Thymol

$t_{(4)}$	\pm	R3	R2	R1	(β /)
-	1.25 ± 1.76	1.66	1.86	1.78	0
0.877	0.091 ± 2.86	2.68	2.97	2.95	10
1.815	0.168 ± 4.05	4.15	4.28	3.72	15
3.010	0.285 ± 5.62	6.00	5.80	5.06	20
4.493*	0.077 ± 7.39	7.25	7.40	7.52	25
6.472*	0.0152 ± 9.85	9.86	9.82	9.87	30
34.55*	0.43 ± 17.88	17.45	18.74	17.45	HNO ₂

.() : 0

.() : HNO₂

t : $t_{(4)}$

. %1 : *

(3)

$.10^{-7} \times 1.76$

: %1 $t_{(4)}$

.1

³ / 20 15 10

$t_{(4)}$

$t_{(4)}$

$10^{-7} \times 1.76$

3.747

A.amstelodami

(Patri and Silano, 1989)

.....

DNA

DNA

.(Bridges *et al.*, 1983)

³ / 30 25 .2

(10⁻⁷ × 7.39) (³ / 25)

3.747 t₍₄₎ 4.493 t₍₄₎ 10⁻⁷ × 1.76

³ / 30

t₍₄₎ 10⁻⁷ × 1.76 10⁻⁷ × 9.85

4.032 t₍₄₎ 3.747

(Azevedok, 1970)

10⁻⁷ × 17.88

.(3)

A.amstelodami

DNA

(Farag *et al.*, 1989)

.(2001) DNA

.(Undeger *et al.*, 2009)

DNA

(Sebile, 2008)

(Baudoux, 2000)

)

.(2004

Liolios *et al.*, Braga *et al.*,2007 Silano, 1989)

.(2009

(1999)
Aspergillus amstelodami
 (2004)
 Thymus Spp.
 (2001)
 (2)12 . *Proteus vulgaris* *Streptococcus pyogenes*
 .25-18
 " (2004)
 (2004)
Nigella sativa L.

- Ames, B. N. ; McCann, J. ; Yamasaki, E. (1975). Methods for detecting carcinogens and mutagens with *Salmonella mammalian* microsome mutagenicity test. *Mutat. Res.*, **31**, 347-363.
- Ameziane, N. ; Boubaker, H. ; Boudyach, H. ; Msanda, F. ; Jilal, A. Benaoumar, A. (2007). Antifungal activity of Moroccan plants against citrus fruit pathogen. *Agron. Sustain. Dev.* **27** (3), 273-277.
- Aydin, S. A. ; Basaran, A. ; Basaran, N. (2005). The effect of thyme volatiles on the induction of DNA damage by heterocyclic amin IQ and mitonycin C. *Mut. Res.* **581**, 43-53.
- Azevedo, J. L. ; Costa, A. (1970) Recessive lethal induced by nitrous acid in *Aspergillus nidulans* . *J. Mutat. Res.*, **10**, 11-117 .
- Babudri, N. ; Politi, M. G. (1989). Different action of MMS and EMS un UV sensitive strains of *A. nidulans* *Mutant. Res.* **217**, 211-217.
- Baudoux, D. (2000). Antiviral and antimicrobial properties of essential oils. <http://www.positivehealth.com/permit/Articales/Aromatherapy/baud55/htm>.
- Braga, P. C. ; Dalsasso, M. ; Culici, M. ; Alfieri, M. (2007). Eugenol and thymol, alone or in combination, induce morphological alternations in the envelope of *Candida albicans*. *Fitoterapia.* **78** (6), 396-400.
- Bridges, B. A. ; Wright, A. V. ; Stannerd, M. ; Moustacchi, E. (1983). "Differential Sensitivity of Certain DNA Damaging Treatments of *E. coli*", In Induced

- mutagenesis, 203, 2016. Edited by E. W. Lawrence, London, Plenum Press. pp. 399-443.
- Bruneton, J. (1999). "Pharmacognosy Phytochemistry Medicinal Plants". Technique and documentation editions medicals internationals, France. 2nd edn., 335 p. and pp.545-547.
- Brusick, D. (1980). "Principles of Genetic Toxicology", Plenum Press, London. pp. 131-144.
- Caten, C. E. (1979). Genetical determination of conidial colour in *Aspergillus heterocaryoticus* and relationship of this species to *Aspergillus amstelodami*. *Trans. Bri. Muc. Soc.*, **73**, 65-74.
- Dhahi, S. J. (1978). Genetic studies in *Aspergillus amstelodami*. Ph. D. Thesis, University of Birmingham, U.K.
- Domenico, T. ; Castelli, F. ; Sarpietro, M. G. ; Venuti, V. ; Cristani, M. ; Daniele, C. ; Saija, A. ; Mazzanti, G. ; Bisignano, G. (2005). Mechanisms of antibacterial action of three monoterpenes. *Antimicrob. Agen. and Chemo.* **49** (6), 2474-2478.
- Elodie, S. ; Robin, S. S. ; Chris, J. P. ; Elena, B. ; Emsley, L. (2009). Powder NMR crystallography of thymol. *Phys. Chem. Chem. Phys.* **11** (15), 2561-2780.
- Farag, R. S.; Daw, Z. Y.; Hewedi, F. M. ; El-Baroty, G. S. A. (1989). Antimicrobial activity of some Egyptian Spice essential oils *Food Port*, **52** (9), 665-669.
- Federal, R. (2003). Thymol and Eucalyptus Oil ; Exemptions from the requirement of atolerance. *Environmental port. Agency.*, **6** (68), 109.
- Hartl, D. L. ; Jones, E. W. (2005). "Genetics". 6th edn. Jones and Bartlett Publishers, Boston. pp. 244-263.
- Ioannis, K. ; Pardali, E. ; Feggon, E. (1998). Insecticidal and genotoxic activities of *oregano* essential oils. *Agricul. and food chem.* **46** (3), 1111-1115.
- Jinks, J. L. ; Croft, J. C. (1971). Methods used for genetical studies in mycology. In: C. Booth(ed) *Methods in Microbiology*. Academic Press, New York. pp. 479-500.
- Korukluoglu, M. ; Gurbuz, O. ; Sahan, Y. ; Yigit, A. ; Kacar, O. ; Rousff, R. (2009). Chemical characterization and antifungal activity of *Organum onites L.* essential oils and extracts. *Food Safety*, **29** (1), 144-161.
- Liolios, C. C. ; Gortzi, O. ; Lalas, S. ; Tsaknis, J. ; Chinou, I. (2009). Liposomal incorporation of carvacol and thymol isolated from the essential oil of *Origanum distamnus L.* and in vitro antimicrobial activity. *Food Chemistry*, **112** (1).
- Liu, X.; Wang, L. ; Li, Y. ; Li, H. ; Yu, T. ; Zheng, X. (2009). Antifungal activity of thyme oil against *geotrichum citri-aurantii* invitro and invivo. *Applied Micro.* **107** (5), 1450-1456.
- McCann, J. ; Ames, B. N. (1978). "The *Salmonella* Microsome Mutagenicity Test: Predictive Value for Animal Carcinogenicity". In: W. G. Flamm and M. A. Mehlman (eds). *Mutagensis*. Hemisphere Publishing Corporation, Washington. pp. 87-108.
- Mezzoug, N. ; Elhadri, A. ; Dallouh, A. (2007). Investigation of the mutagenic and antimutagenic and effect of *Origanum compactum* essential oil and some of its constituents. *Mut. Res.* **629** (2), 100-110.

- Panizzi, L.; Flamini, G. ; Cioni, P. L. ; Morelli, I. (1993). Composition and antimicrobial properties of essential oils of four mediterranean iamiaceae. *Ethnopharmacology*, **39**, 167-170.
- Patri, G. ; Silano, V. (1989). "Plant Preparations Used as Ingredients of Cosmetic Products". Council of Europ, Istedn. Strasbourg. pp. 118-121.
- Razzaghi, A. M. ; Shams, G. M. ; Yoshinari, T. ; Rezaee, M. B. ; Jaimand, K. ; Nagasawa, H. ; Sakuda, S. (2008). Inhibitory effects of *Satureja hortensis* L. essential oil on growth and aflatoxin production by *Aspergillus parasiticus*. *Int. Food Microbiology*, **27** (3), 273-277.
- Roni, S. ; Efrat, M. (2007). Iolation and characterization of *Escherichia Coli* mutants exhiting altered respons to thymol. *Microbial Drug Resistance*. **13** (3), 157-165.
- Sebile, A. ; Eyyup, R. (2008). The in vivo enotoxic effects of carvacol and thymol in rat bone marrow cells. *Environmental toxicology water Quality*. **23** (6), 728-735.
- Sokovic, M. D. ; Vukojevic, J. ; Marin, P. D. ; Brakic, D. D. ; Vais, V. ; Grienseven, V. L. (2009). Chemical composition of essential oils thymus and menthe species and their antifungal activities. *Molecules*, **14** (1), 49-238.
- Steel, R. G. ; Torrie, J. H. (1980). "Principles and Procedures of Statics". McGraw-Hill, New York. pp. 89-123.
- Sugimora, T. ; Kawachi, T. ; Matsushima, T. (1977). "A - Critical Review of Submmalion System for Mutagen. In Progress in Genetic Toxicology". Edited by D. Scott, B. R. Bridge and F. H. Sobels, N. H. Biomedical Press. London. pp. 125-140.
- Sugimura, T. (2000). Nutrition and dietary carcinogens. *Carcinogenesis*, **21**, 387-395.
- Talei, G., Meshkatalasadant, M. (2007). Antibacterial activity and chemical constitutions of essential oils of thymus persicus and thymus eriocalyx from west of Iran. *Bio. Sci*. **10** (21), 3923.
- Undeger, U. ; Basaran, A. ; Degen, G. H. ; Basaran N. (2009). DNA damage in V79 chinse hamster lung fibroblast cells at low levels of carvacol and thymol. *Muta. Resea*. **581** (2), 43-53.