

# **Pesticide residues in food - 1986**

FAO  
PLANT  
PRODUCTION  
AND PROTECTION  
PAPER

**78**

**Sponsored jointly by FAO and WHO**

## **EVALUATIONS**

**1986**

**PART I - RESIDUES**



FOOD  
AND  
AGRICULTURE  
ORGANIZATION  
OF THE  
UNITED NATIONS

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Joint meeting of the  
FAO Panel of Experts on Pesticide Residues  
in Food and the Environment  
and the  
WHO Expert Group on Pesticide Residues  
Rome, 29 September - 8 October 1986



FOOD  
AND  
AGRICULTURE  
ORGANIZATION  
OF THE  
UNITED NATIONS  
Rome, 1986

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These evaluations were prepared under the aegis of two international groups of experts and do not necessarily represent the decisions or the stated policy of the Food and Agriculture Organization of the United Nations or of the World Health Organization.

M-84  
ISBN 92-5-102538-X

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1986 JOINT MEETING OF THE FAO PANEL OF EXPERTS ON PESTICIDE RESIDUES  
IN FOOD AND THE ENVIRONMENT AND THE WHO EXPERT GROUP ON  
PESTICIDE RESIDUES

Rome, 29 September - 8 October 1986

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## ABBREVIATIONS WHICH MAY BE USED IN THIS REPORT

(n.b.: chemical elements and pesticides are not included in this list)

ACH <sub>E</sub>	acetylcholinesterase
ADI	Acceptable Daily Intake
TADI	Temporary Acceptable Daily Intake
ai	active ingredient
approx.	approximate
at. wt.	atomic weight
b.p.	boiling point
c	centi - ( $\times 10^{-2}$ )
$^{\circ}\text{C}$	degree Celsius (centigrade)
CCPR	Codex Committee on Pesticide Residues
cm	centimetre
CNS	central nervous system
cu	cubic
<u>DL</u>	racemic (optical configuration, a mixture of dextro- and laevo-; preceding a chemical name)
EC	emulsion concentrate
F <sub>1</sub>	filial generation, first
F <sub>2</sub>	filial generation, second
f.p.	freezing point
FAO	Food and Agriculture Organization of the United Nations
g	gram
$\mu\text{g}$	microgram
GAP	good agricultural practice
G.I.	gastro-intestinal
GPC	gel-permeation chromatography
GLC	gas-liquid chromatography
h	hour(s)
ha	hectare
Hb	haemoglobin
i.m.	intramuscular
i.p.	intraperitoneal
IR	infrared
i.v.	intravenous
JMPR	Joint Meeting on Pesticide Residues (Joint Meeting of the FAO Panel of Experts on Pesticide Residues in Food and the Environment and the WHO Expert Group on Pesticide Residues)
k	kilo- ( $\times 10^3$ )
kg	kilogram

l	litre
LC <sub>50</sub>	lethal concentration, 50%
LD	lethal dose
LD <sub>50</sub>	lethal dose, median
m	metre
mg	milligram
μm	micrometre (micron)
min	minute (s)
ml	millilitre
MLD	minimum lethal dose
mm	millimetre
M	molar
mo	month(s)
m.p.	melting point
MRL	Maximum Residue Limit (This term replaces "tolerance")
TMRL	Temporary Maximum Residue Limit
N	normal (concentration)
no.	number
NOEL	no-observed-effect level
NOAEL	no-observed-adverse-effect level
<u>o</u>	ortho (indicating position in a chemical name)
<u>p</u>	para (indicating position in a chemical name)
PHI	pre-harvest interval
ppm	parts per million (Used only with reference to the concentration of a pesticide in an experimental diet. In all other contexts the terms mg/kg or mg/l are used.)
s.c.	subcutaneous
SD	standard deviation
SE	standard error
sp./spp.	species (only after a generic name)
sp gr	specific gravity
sq	square
t	tonne (metric ton)
<u>tert</u>	tertiary (in a chemical name)
TLC	thin-layer chromatography
UV	ultraviolet
v/v	volume ratio (volume per volume)
WHO	World Health Organization
wk	week
WP	wettable powder
wt	weight
wt/vol	weight per volume
w/w	weight per weight
yr	year
<	less than
≤	less than or equal to
>	greater than
≥	greater than or equal to

## INTRODUCTION

The report of the Joint Meeting of the FAO Panel of Experts on Pesticide Residues in Food and the Environment and the WHO Expert Group on Pesticide Residues, held in Rome from 29 September to 8 October 1986, contains a summary of the evaluations of residues in foods of the various pesticides considered at the session as well as information on the general principles followed by the meeting. The present document contains summaries of the residues data considered, together with the recommendations made.

The Evaluations are issued in two parts:

- Part I: Residues (by FAO)
- Part II: Toxicology (by WHO)

For those interested in both aspects of pesticide evaluation, not only both parts but also the reports containing summaries of residues and toxicological considerations will be available. Special attention is drawn to Annex I containing up-dated ADIs, MRLs, temporary MRLs and Guideline Levels, which also appears in full as part of the report of the meeting.

Some of the compounds considered at this meeting have been previously evaluated and reported on in earlier publications. Only new information is summarized in the relevant monographs and reference is made to previously published evaluations, which should also be consulted. Such monograph addenda are indicated by an asterisk (\*) in the Table of Contents.

The name of the compound appearing as the title of each monograph is followed by its Codex Classification Number in parentheses.

### Acknowledgements

The monographs in these Evaluations were prepared by the following participants in the 1986 JMPR for the FAO Panel of Experts on Pesticide Residues in Food and the Environment: Dr D.C. Abbott, Professor Dr A.F.H. Besemer, Dr D.J. Hamilton, Mr N.F. Ives, Mr A.F. Machin, Mr J.T. Snelson and Mr K. Voldum-Clausen.

Note: Any comments on residues in food and their evaluation should be addressed to the:

Pesticide Residue Specialist  
Plant Protection Service  
Plant Production and Protection Division  
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Via delle Terme di Caracalla  
00100 Rome, Italy



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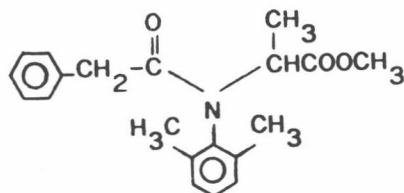
# BENALAXYL (155)

## IDENTITY

Chemical name: methyl N-phenylacetyl-N-2-2,6-xylyl-DL-alaninate (IUPAC)

Synonyms: M 9834, Galben

Structural formula:



Molecular formula:  $C_{20}H_{23}NO_3$

## Other information on identity and properties

### Pure active ingredient:

Appearance:	Crystalline solid, white to yellowish	
Density ( $d_4^{25}$ ):	1.27	
Melting point:	78-80°C	
Odour:	Scarcely detectable	
Solubility at 25°C:	water	37 mg/1000 ml
	methanol, ethanol, acetone, acetonitrile, dimethylformamide, chloroform, methylene chloride and carbon tetrachloride:	>50%
	cyclohexanone	>40%
	xylene	>30%
	n-hexane	< 5%
	coconut oil	9%
	castor oil	14%
Vapour pressure:	$5 \times 10^{-6}$ mm Hg at 25°	
Stability to heat:	Stable up to 250°C under nitrogen.	
	Stable (<1% loss) at 54°C for 14 days and 40°C for 3 months.	
Stability to hydrolysis:	Stable within a range of pH from 4 to 9.	
	Hydrolyzed in strong basic media.	
Octanol/water partition coefficient (P): $\log P = 3.4$ .		

### Technical active ingredient:

Purity: 94-96%. Detailed information on the impurities in the technical product was made available to the meeting. Except for N(2,6-dimethyl-phenyl)-2-phenylacetamide (2-4%) all impurities were less than 1%.

## RESIDUES IN FOOD AND THEIR EVALUATION

### USE PATTERN

#### Pre-harvest Uses

Benalaxyl is a systemic fungicide active against Oomycetes and fungi belonging to the family Peronosporaceae and to Phytophthora, Plasmopara, Pseudoperonospora, Sclerospora, Bremia and Pythium. It is absorbed by the shoots, leaves, green stems and roots of plants. It acts on the outside of the plant on the reproductive organs of the pathogen, and it enters the epidermal tissues, migrates to the cell walls and moves along with the transpiration stream via the xylem vessels.

It is formulated as 5% granules, 24% emulsifiable concentrate, 25% wettable powder and 35% powder. Other formulations contain benalaxyl in mixtures with mancozeb, copper oxychloride or folpet.

The compound is used on grapes, tomatoes, potatoes, peppers, onions, hops, maize and strawberries.

#### Post-harvest Uses

No information has been reported on post-harvest uses of benalaxyl. The meeting was informed that benalaxyl is registered and sold in 16 countries. Some registrations and approved uses are listed in Table 1. The meeting was informed that a pre-harvest interval of 7 days is required for grapes, melons, onions, peppers, potatoes and tomatoes in the countries where benalaxyl is registered.

Table 1. Some registrations and approved uses for benalaxyl

Country	Commodity	<u>Approved application rate</u>	
		kg ai/ha	g ai/100 l
Australia	Cucumbers	0.24	
	Grapes	0.27	
	Melons	0.15	
	Onions	0.25	
Fed.Rep. of Germany	Hops	0.80	
	Potatoes	0.16	
France	Grapes	0.12-0.15	12-15
Greece	Potatoes	0.11	
Italy	Grapes	0.16-0.20	16-20
	Onions		16-20
	Peppers	2	
	Potatoes		20-24
	Tomatoes	0.2-0.35	20-35
New Zealand	Grapes		16
	Potatoes	0.2	20
	Tomatoes	0.3	30
United Kingdom	Potatoes	0.16	

## RESIDUES RESULTING FROM SUPERVISED TRIALS

Supervised trials were carried out on a variety of crops with the 25% wettable powder, 5% granules or mixtures of benalaxyl with mancozeb, folpet or copper oxychloride. Only the parent compound was determined.

All supervised trials were carried out by Farmoplant in Italy, the Federal Republic of Germany (FRG), Australia, New Zealand, France and Greece. The results are presented in Tables 2 to 8; results are underlined when the treatment has been in accordance or approximately in accordance with an approved use and with the recommended withholding period in the country in which the trial was carried out.

### Grapes

A large number of supervised trials were carried out on grapes in Italy, in all cases with several treatments (5-10) on the crop mostly with a 2-week interval between treatments. Similar treatments were applied in France, FRG, New Zealand and Australia. In all countries except Germany, residues were below 0.2 mg/kg 2-3 weeks after the last treatment. In Germany residues from some treatments were considerably higher: 0.5-0.7 mg/kg after 2 weeks and of the order of 0.2-0.5 mg/kg after 5 weeks. In two trials in Germany residues also were determined in must and wine, which contained 0.03-0.04 mg/kg. The higher residues are presumably caused by a low volume application. The compound is not registered for use on grapes in the FRG.

### Potatoes

Trials were carried out in several countries with treatments from 0.11 to 0.50 kg/ha and 2-7 applications. All residues were lower than the limit of determination, 0.01 mg/kg, even with treatment just before harvest.

### Tomatoes

Experiments were carried out in Italy and New Zealand, where tomatoes in open fields and greenhouses were treated. In most experiments residues were low a few days after treatment. In experiments in Italy (1982-83) in which the behaviour of benalaxyl in a greenhouse was compared with the behaviour of other fungicides, residues of benalaxyl were considerably higher than in other experiments. Although these experiments were carefully controlled they were possibly not in full accordance with conditions when the fungicide is used in practice.

### Peppers

Trials in Italy with treatments on foliage or soil with 4-5 applications gave rise only to residues at or about the limit of determination even 5-6 days after treatment.

### Onions

Residues from trials in Italy and Australia were low when treatments were in accordance with recommended uses.

### Cucumbers and melons

Residues in cucumbers from trials in Australia were all below the limit of determination, and residues on melons from trials in the same country were below 0.1 mg/kg one week after treatment.

### Hops

Treatment of hops gave rise to residues below 0.1 mg/kg in the dry cones 120-150 days after treatment.

Table 2. Supervised trials with benalaxyl on grapes

Country and year	Formulation	No. of experiments	Application rate kg ai/ha	Application rate g ai/100 l	No. of applications	Residues (mg/kg/Days after final application)							
						1-3	5-6	7-9	12-15	16-18	20-25	26-49	
Italy 1979	25% WP	1	0.18	15	7							0.08	
		3	0.30	25	7							0.09-0.12	
		1	0.60	50	7							0.29	
1980		1	0.10	8	8	0.12			0.04		0.05	0.02	
		3	0.15	12.5	8	0.14-0.20		0.05-0.09	0.04-0.08		0.03-0.07	0.01-0.03	
		1	0.19	16	8	0.71		0.22	0.21		0.13	0.08	
		6	0.30	25	8	0.24-0.45		0.12-0.33	0.07-0.21		0.06-0.12	0.03-0.05	
1981		8	0.09-0.12	10-16	6-10	0.07		0.02-0.07	0.02-0.06	0.02-0.05	<0.01-0.04	0.01-0.02	
		8	0.15-0.19	16-20	6-10	0.14-0.16		0.03-0.05	0.05-0.12	0.02-0.09	<0.01-0.07	0.03-0.04	
		6	0.20-0.23	20-25	6-10	0.06-0.10		0.03-0.08	0.01-0.07	0.03-0.08	<0.01	0.02-0.06	
		1	0.25	25	7	0.03							
France 1981 1982	benalaxyl & mancozeb folpet or copper	10	0.012-0.120	12	6-7	0.07-0.13		0.07-0.16	0.03-0.18		0.04-0.16	0.01-0.08	
		17	0.12		5-10						0.01-0.12	0.01-0.08	
New Zealand 1982-83	Mixed	1	0.16	16	7	0.20-0.30		0.22	0.18		0.01		
		1	0.32	32	7	0.35-0.61		0.27	0.24		0.07		
Fed. Rep. of Germany 1982 1983 1984	Mixed	2	0.09	15	8	0.73-0.96				0.45-0.75	0.21-0.56	0.11-0.28	....
		1	0.25	50	7	1.13			0.38	0.04	0.24-0.33	0.19-0.21	
		4	0.25	62	8	0.90-1.30			0.49	0.26-0.57	0.28-0.56	0.25	
									0.47-0.71	Must	Must	0.04	
Australia 1985	Mixed	1	0.275	27.5	1	0.42		0.13-0.21	0.05				
		1	0.55	55	1	0.80		0.22-0.36	0.09				



Table 3. Supervised trials with benalaxyl on potatoes

Country and year	Formulation	No. of experiments	Application rate		No. of applications	Residues (mg/kg)/Days after final application				
			kg ai/ha	g ai/100 l		0-1	4-9	14-18	21-30	45
Italy 1979	25% WP	1	0.25	25	4			<0.01		
		1	0.50	50	4			<0.01		
1980		1	0.175	25	4	<0.01	<0.01			
		1	0.35	50	4	<0.01	<0.01			
1981		2	0.16	16	4		<0.01	<0.01	<0.01	
		2	0.22	22	4		<0.01	<0.01	<0.01	
New Zealand 1982-83	benalaxyl & mancozeb	1	0.20	30	7	<0.01	<0.01	<0.01		
		1	0.40	60	7	<0.01	<0.01	<0.01		
United Kingdom 1983 1984		5	0.16	64	4					<0.01
		5	0.16	64	6				<0.01	
		3	0.16	64	5		<0.01			
Greece 1985	benalaxyl & copper benalaxyl & macozeb	1	0.11	22	4		<0.01	<0.01	<0.01	
		1	0.11	22	4		<0.01	<0.01	<0.01	
Fed. Rep. of Germany 1982		2	0.16		2	<0.01	<0.01			

Table 4. Supervised trials with benalaxyl on tomatoes

Country and year	Formulation	No. of experiments	Application rate		No. of applications	Residues (mg/kg)/Days after final application				
			kg ai/ha	g ai/100 l		0-3	4-9	10-15	16-25	26-35
Italy 1979 (open field)	25% WP	1	0.25	25	4				0.01	
		1	0.50	50	4				0.02	
1980 (greenhouse)		2	0.25	25	4	0.08-0.13		0.02-0.04	0.01-0.05	
		1	0.50	50	4	0.10		0.07	0.01-0.06	
(open field)		2	0.25	25	4	0.08	0.01	<0.01	<0.01	
		1	0.50	50	4	0.24	0.03	0.01	<0.01	
1981 (greenhouse)		2	0.37-0.50	25	4	0.08-0.13		0.01-0.02	<0.01	
1982-83 (greenhouse)		1	0.38		1	0.50-0.71	0.38	0.21	0.17	<0.02
		2	0.38		5		0.66-0.84	0.55-0.64	0.49-0.54	0.18-0.20
		1	0.76		1	0.78-0.91	0.52	0.35	0.21	<0.02-0.06
New Zealand 1982-83 (open field)	benalaxyl & mancozeb	2	0.2 & 0.4	20 & 40	6	0.18	0.03-0.08	0.01-0.06	<0.01-0.05	
		1	0.2	20	7	0.20	0.09-0.12	0.08	<0.01-0.02	
		1	0.4	40	7	0.52	0.23-0.26	0.14	0.05-0.08	

Table 5. Supervised trials with benalaxyl on peppers

Country and year	Formulation	No. of experiments	Application rate		No. of applications	Residues (mg/kg)/Days after final application			
			kg ai/ha	g ai/100 l		5-6	14-17	22-23	
Italy 1980	25% WP (on foliage)	1	0.25		5	<0.01	<0.01	<0.01	
	5% Gran. (on foliage)	1	1.0		5	<0.01	<0.01	<0.01	
1981	5% Gran. (on soil)	2	2.0		4	<0.01	<0.01	<0.01	
	25% WP (on foliage)	1	2.0		4	0.03	<0.01	<0.01	

Table 6. Supervised trials with benalaxyl on onions

Country and year	Formulation	No. of experiments	Application rate		No. of applications	Residues (mg/kg)/Days after final application				
			kg ai/ha	g ai/100 l		0-2	4-7	10-15	24-26	
Italy 1980	25% WP	1	0.125-0.15	25	5	0.32		0.11	0.01	
		1	0.25-0.30	50	5	1.31		0.04	0.02	
1981	benalaxyl & copper	1	0.16	16	5		<0.01	<0.01	<0.01	
		2	0.22	22	5		<0.01-0.03	<0.01	<0.01	
Australia 1984	benalaxyl & mancozeb	1	0.24	24	1	0.03-0.13	0.02-0.07	0.03-0.09		
		1	0.48	48	1	0.12-0.22	0.11-0.39	0.09-0.25		

Table 7. Supervised trials with benalaxyl on cucumbers and melons

Country and year/ crop	Formulation	No. of experiments	Application rate		No. of applications	Residues (mg/kg)/Days after final application			
			kg ai/ha	g ai/100 l		0-1	2-4	7	10-14
Australia 1985 Cucumbers	benalaxyl and mancozeb	1	0.24	24	1	0.01-0.04	<0.01	<0.01	<0.01
		1	0.48	48	1	0.03-0.06	<0.01-0.01	<0.01	<0.01
Australia 1984 Melons	benalaxyl and mancozeb	1	0.133	24	6	0.13-0.21	0.06-0.08	0.05	0.01-0.02
		1	0.267	48	6	0.28-0.49	0.09-0.17	0.06	0.03

Table 8. Supervised trials with benalaxyl on hops

Country and year	Formulation	No. of experiments	Application rate		No. of applications	Residues (mg/kg)/Days after final application			
			kg ai/ha	g ai/100 l		121-130	131-140	141-150	
Fed. Rep. of Germany 1980	5% Gran.	4	0.9		1	<0.05-0.06	<0.05-0.14		
1981		3	4 g/bine	1 g/bine	1		0.04		0.04-0.06
		1			1				0.03