5-AMINOURACIL
SYNCHRONIZATION OF THE CELL CYCLE OF *VICIA FABA* ROOT TIP MERISTEMS

A thesis

presented in partial fulfilment

of the requirements for the Degree

of

Master of Science in Biology

at

Massey University

JENNIFER ANN BUTCHER

1977

ABSTRACT

This study was undertaken to try and find how the thymine analogue 5-aminouracil induces cell synchrony in the cell cycle of plant root meristems. It has previously been used as a synchronizing agent without knowing its mode of action.

The experiments confirmed the synchronization effect and that the removal of plants from 5AU stimulated the cells to divide. Results indicated that the late S and early G_2 phases of the cell cycle were the most affected, with DNA synthesis continuing in the presence of 5AU at a reduced rate. The inhibition of division caused by 5AU could be reversed by other bases and mixtures.

The G_1 phase was found not to be affected by 5AU but it was postulated that cells in early G_2 were slowed down or halted by the chemical. DNA density measurements were taken of nuclei treated continuously for varied times with 5AU, and these results confirmed a buildup of cells in the latter third of the S phase found by other workers. The presence of Feulgen-negative regions in chromatids of the 5AU treated tissue was noted and linked with possible interference in heterochromatin synthesis. The possibility of some enzyme function important in the final joining together of DNA units being interfered with by 5AU is also discussed. Suggestions are made for further possible avenues of work into DNA synthesis.

The significance of cell cycle studies and their experimental design has recently been reconsidered and is mentioned in view of this work and other cell population studies.

ACKNOWLEDGEMENTS

I would firstly like to thank my supervisor Dr E D Penny of the Botany Department, Massey University, for his continual guidance during the course of this study, and for his valued criticism of the manuscript.

My thanks also go to Dr K Giles of the Plant Physiology Division, DSIR, Palmerston North, for his unlimited assistance with the fluorescence photography and making the fluorescence microscope and several stains available for my use.

The generosity of Dr P Fitzgerald of the Cytogenetics Unit, Christchurch Hospital, in allowing my use of the Vickers M85 Integrating Microdensitometer is also greatfully appreciated.

I would also like to thank Professor R Thomas for advise and discussion on different aspects of this study.

Finally to my husband Mike must go thanks for his continued encouragement, and especially for assistance with photography and diagrams.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS USED IN TEXT

5AU	5-aminouracil
BAO	2,5-bis[4'-aminophenyl-(1')]-1,3,4-oxadizole
CdR	deoxycytidine
H^3-CdR	tritiated deoxycytidine
DNA	Deoxyribonucleic acid
DNase	Deoxyribonuclease
FUdR	5-fluorouracil-2-deoxyriboside
H^3	tritium
LI	Labeling Index
MI	Mitotic Index
ppm	parts per million
RNA	Ribonucleic acid
RNase	Ribonuclease
TdR	thymidine
H^3-TdR	tritiated thymidine