CONTENTS

	Page
Contents	(x)
List of Tables	
List of Figures	
List of Abbreviations and Symbols	(xvi)
Chapter	
1 Introduction	1
1.1 Introduction	1
1.2 Literature review	3
1.2.1 Phenomenon and regulation of flowering	3
1.2.2 Flowering process and reproductive development	9
1.2.3 Experimental system and methods of	
developmental analysis	11
1.2.4 <i>In vitro</i> flower induction system: new tool	
for flowering studies	13
1.2.5 Characteristics of the pigeon orchid: <i>D. crumenatum</i> Swartz	16
1.3 Objectives of the research	24
2 Materials and methods	25
2.1 Investigation of flowering pattern and pollen grain maturation	26
2.2 Determination of the natural stimulus and the effective	
physical and biological stimuli required for flowering	27

CONTENTS (CONTINUED)

			Page
	2.3	In vitro plant regeneration through embryogenesis	
		and organogenesis	29
	2.4	In vitro floral bud induction system and flowering	34
3	Res	sults	36
	3.1	Investigation of flowering pattern and pollen grain maturation	36
		3.1.1 Flowering pattern and floral bud at the responsive stage	36
		3.1.2 Time of pollen grain maturation	40
	3.2	Determination of natural stimulus and the effective stimuli	
		required for flowering	40
		3.2.1 A sudden drop in temperature as a trigger	40
		3.2.2 Low temperature as an effective physical stimulus	43
		3.2.3 A separate application of BA and GA ₃ hormone	
		as an effective biological stimulus	47
	3.3	In vitro plant regeneration through embryogenesis	
		and organogenesis	50
		3.3.1 Developmental phases of plant regeneration	50
		3.3.2 Suitable media for the three main developmental phases	50
		3.3.3 Plant development via either somatic embryogenesis	
		and organogenesis	54
	3.4	<i>In vitro</i> floral bud induction system and flowering	55

CONTENTS (CONTINUED)

	Page
3.4.1 Some stages of natural floral development	
served as a control	55
3.4.2 <i>In vitro</i> floral organ induction	58
3.4.3 Flowering of some induced plants after placing under	
natural greenhouse conditions	60
4 Discussion	65
5 Conclusions	76
References	80
Appendices	89
Vitae	98

LIST OF TABLES

Fable		Page
1	Markers for pollen grain development of D. crumenatum	
	based on the cytological appearance.	42
2	Effect of various periods of cold treatment on	
	the flowering of <i>D. crumenatum</i>	46
3	Effect of plant growth regulators (PGRs) application on	
	the flowering of <i>D. crumenatum</i>	48
4	Effect of basal media supplemented with various substances	
	on various developmental phases of D. crumenatum	52
5	Details of a typical pattern of temperature variation throughout	
	the day on induction days and non-induction days	96

LIST OF FIGURES

Figure	ligure	
1	Morphological characteristics of D. crumenatum	20
2	Flowers of <i>D. crumenatum</i> orchid show opened flowers	
	with pure glittering white and the lip has a bright yellow disc	21
3	SEM micrographs showing the initial differentiation of	
	the flower primordium of <i>Bletia purpurea</i> (Epidendroideae).	23
4	The natural inflorescence of <i>D. crumenatum</i> orchid taken	
	on the flowering day	37
5	The possible events of the natural flowering of <i>D. crumenatum</i>	38
6	Micrographs show details of an inflorescence of <i>D. crumenatum</i>	39
7	Pollen grain development of D. crumenatum from	
	the induction day to the day of anthesis	41
8	A typical pattern of temperature variation throughout the day	
	on induction days (d0)	44
9	A typical pattern of temperature variation throughout the day	
	on non-induction days	45
10	Photographs show flowering response of plants	
	treated with 10 ⁻¹ M BA	49
11	Developmental phases of plant regeneration	51
12	Plant developed through somatic embryogenesis	56
13	Shoots developed through organogenesis	57

LIST OF FIGURES (CONTINUED)

Figure		Page
14	SEM and LM micrographs show the floral buds of <i>D. crumenatum</i>	n
	at some stages of the natural floral development	59
15	Median longitudinal sections of the sequence of developmental	
16	events in cultured mini-shoots of <i>D. crumenatum</i> Schematic illustrating the developmental events	61
	of D. crumenatum cultured in vitro	62
17	Flowering of the induced plant after placing under natural	
	greenhouse conditions	64

LIST OF ABBREVIATIONS AND SYMBOLS

AC = Activated charcoal

ANOVA = Analysis of variance

BA = Benzyladenine

CI = callus initiation medium

CRD = completely randomized design

CW = coconut water

DMRT = Duncan's multiple range test

DTA = day(s) to anthesis

 GA_3 = Gibberellic acid

HP = Hyponex medium

KC = Knudson medium

LM = Light microscopy

M = Molar

NAA = 1- Naphtalenacetic acid

NC = nodular compact structure

PLBs = Protocorm-like bodies

PGR = Plant growth regulator

SAM = Shoot apical meristem

SEM = Scanning electron microscopy

SPSS = Statistical Package for Social Science

VW = Vacin and Went medium