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HORMONAL CONTROL OF BRANCHING AND FLOWERING IN *ZANTEDESCHIA* SPECIES

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Abstract

Calla lilies (*Zantedeschia* sp. Family: Araceae) are perennial herbaceous geophytes, gaining commercial importance as a cut flower and potted flowering plant. Stimulating branching in *Zantedeschia* would equate to higher floral productivity via increasing tuber size/weight and/or via triggering the sympodial flowering cascade. Bud outgrowth is however controlled by an autonomous developmental programme, executed via different degrees of para- (apical dominance) and/or endodormancy.

Based on visual clues that represent underlying changes in the shoot apical meristem, the growth cycle of *Zantedeschia* was demarcated into three phases, which coincide with the transition of buds from apical dominance to endodormancy. Application of 6-benzylaminopurine (BAP; an aromatic cytokinin) was successful in stimulating branching in phase 1. This equated to an increase in tuber size/weight, which in turn resulted in increased floral productivity in the next growth cycle. . Efficacy of BAP alone to stimulate branching declined from phase 1 to phase 3, and the need for a sequential application of gibberellin (GA_3) increased concomitantly. GA_3 alone had no effect on branching. Efficacy of GA_3 alone to stimulate flowering declined from phase 1 to phase 3, and the need for a sequential application of BAP increased concomitantly. BAP alone had no effect on flowering. Stimulation of branching and enhanced flowering achieved by the reciprocal cross-talk between cytokinin and gibberellin may have major commercial implications.

When applied with unlabelled BAP, a significant decline in the uptake of [8-^{14}C] BAP ([8-^{14}C] BAP + BAP) was observed in phase 3, resulting in a decline in radioactivity available in the buds and upper region of the tuber. With unlabelled GA_3 ([8-^{14}C] BAP + GA_3) however, increased radioactivity was available in these parts in phase 3. *Meta*-topolin (mT) was identified as a metabolic product of BAP. Application of [8-^{14}C] BAP + BAP resulted in a decline in the amount of mT from phase 1 to phase 3. However, application of [8-^{14}C] BAP + GA_3 resulted in an increase in the amount of mT in phase 3. mT and 6-benzylaminopurine riboside (BAR) were also identified in natural plants.

Further studies on branching control in phase 1 involving topolins and strigolactones, elucidating the mechanisms of cross-talk between cytokinin and gibberellin in phase 3, reevaluating the relationship between branching and floral productivity, and corroborating the common mechanisms between dormancy and flowering are recommended.

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Table of Contents

List of Figures

List of Tables

List of Appendices

List of Abbreviations

[$^{2}H_{7}$] BAP	Deuterated 6-benzylaminopurine
[$^{2}H_{7}$] BAR	Deuterated 6-benzylaminopurine riboside
[^{3}H]-iP	Tritiated isopentenyl adenine
[^{3}H]-Z	Tritiated zeatin
[8-^{14}C] BAP	Radioactive 6-benzylaminopurine
ABA	Abscisic acid
Ade	Adenine
Ado	Adenosine
AMP	Adenosine monophosphate
AP 1	*APETALA 1*
ARCK	Aromatic cytokinin
ATI	Auxin transport inhibitors
BAP	6-benzylaminopurine
BAR/BARP/BA9G	6-benzylaminopurine riboside/6-benzylaminopurine ribotide/6-benzylaminopurine 9-glucoside
BSA	Bovine serum albumin
CK	Cytokinin
CKX	*CYTOKININ OXIDASE/DEHYDROGENASE*
CO	*CONSTANS*
DAP	Days after planting
DMRT	Duncan's multiple range test
DPM	Disintegrations per minute
FLC	*FLOWERING LOCUS C*
FT	*FLOWERING LOCUS T*
FW	Fresh weight
GA_{n}	$Gibberellin_{respective\ number}$
HFCA	9–hydroxyfluorene–9–carboxylic acid
HPLC	High performance liquid chromatography

iP	Isopentenyl adenine
IPT	*ISOPENTENYL TRANSFERASE*
ISCK	Isoprenoid cytokinin
LC-MS	Liquid chromatography-Mass spectrometry
LD	Long day
LFY	*LEAFY*
LOG	*LONELY GUY*
LSD	Least significant difference
Min	Minutes
MRI	Magnetic resonance imaging
MRM	Multiple reaction monitoring
mT/mTR	*Meta*-topolin/ *Meta*-topolin riboside
NPA	1–N–Naphthalphthalamic acid
NSB	Non specific binding
NZ	New Zealand
oT/oTR/ oMeoT/ oMeoTR	*Ortho*-topolin/ *Ortho*-topolin riboside/ methoxy *Ortho*-topolin/ methoxy *Ortho*-topolin riboside
PAT	Polar auxin transport
PFT1	*PHYTOCHROME AND FLOWERING TIME 1*
pT/pTR	*Para*-topolin/ *Para*-topolin riboside
SAM	Shoot apical meristem
SOC1	*SUPPRESSOR OF OVEREXPRESSION OF CONSTANS 1*
TBS	Tris buffered saline
TIBA	2, 3, 5–triiodobenzoic acid
Z/tZ	Zeatin/*trans*-zeatin