

CONTENTS.

CHAPTER L

•>•

INTRODUCTORY REMARKS.

CHAPTER II.

Convolvulaceæ.

Ipomæa purpurea, comparison of the height and fertility of the crossed and self-fertilised plants during ten successive generations—Greater constitutional vigour of the crossed plants—The effects on the offspring of crossing different flowers on the same plant, instead of crossing distinct individuals—The effects of a cross with a fresh stock—The descendants of the self-fertilised plant named Hero—Summary on the growth, vigour, and fertility of the successive crossed and self-fertilised generations—Small amount of pollen in the anthers of the self-



iv CONTENTS.

CHAPTER III.

SCROPHULARIACEÆ, GESNERIACEÆ, LABIATÆ, ETC.

Mimulus luteus; height, vigour, and fertility of the crossed and self-fertilised plants of the first four generations—Appearance of a new, tall, and highly self-fertile variety—Offspring from a cross between self-fertilised plants—Effects of a cross with a fresh stock—Effects of crossing flowers on the same plant—Summary on Mimulus luteus—Digitalis purpurea, superiority of the crossed plants—Effects of crossing flowers on the same plant—Calceolaria—Linaria vulgaris—Verbascum thapsus—Vandellia nummularifolia—Cleistogene flowers—Gesneria pendulina—Salvia coccinea—Origanum vulgare, great increase of the crossed plants by stolons—Thunbergia alata ... 63—97

CHAPTER IV.

CRUCIFERÆ, PAPAVERACEÆ, RESEDACEÆ, ETC.



CONTENTS.

V

CHAPTER V.

GERANIACEÆ, LEGUMINOSÆ, ONAGRACEÆ, ETC.

Pelargonium zonale, a cross between plants propagated by cuttings does no good — Tropæolum minus — Limnanthes douglasii — Lupinus luteus and pilosus — Phaseolus multiflorus and vulgaris — Latbyrus odoratus, varieties of, never naturally intercross in England — Pisum sativum, varieties of, rarely intercross, but a cross between them highly beneficial—Sarothamnus scoparius, wonderful effects of a cross — Ononis minutissima, cleistogene flowers of — Summary on the Leguminosæ — Clarkia elegans — Bartonia aurea — Passiflora gracilis — Apium petroselinum — Scabiosa atropurpurea — Lactuca sativa — Specularia speculum — Lobelia ramosa, advantages of a cross during two generations — Lobelia fulgens — Nemophila insignis, great advantages of a cross — Borago officinalis — Nolana prostrata.

Page 142-187

CHAPTER VI.

Solanaceæ, Primulaceæ, Polygoneæ, etc.

Petunia violacea, crossed and self-fertilised plants compared for four generations — Effects of a cross with a fresh stock — Uniform colour of the flowers on the self-fertilised plants of the fourth generation — Nicotiana tabacum, crossed and self-fertilised plants of equal height — Great effects of a cross with a distinct sub-variety on the height, but not on the fertility, of the off-spring — Cyclamen persicum, crossed seedlings greatly superior to the self-fertilised — Anagallis collina — Primula veris — Equal-styled variety of Primula veris, fertility of, greatly increased by a cross with a fresh stock—l'agopyrum esculentum — Beta vulgaris — Canna warscewiczi, crossed and self-fertilised plants of equal height — Zea mays — Phalaris canariensis.

188 - 237



vi

CONTENTS.

CHAPTER VII.

SUMMARY OF THE HEIGHTS AND WEIGHTS OF THE CROSSED AND SELF-FERTILISED PLANTS.

Number of species and plants measured—Tables given—Preliminary remarks on the offspring of plants crossed by a fresh
stock—Thirteen cases specially considered—The effects of
crossing a self-fertilised plant either by another self-fertilised
plant or by an intercrossed plant of the old stock—Summary
of the results—Preliminary remarks on the crossed and selffertilised plants of the same stock—The twenty-six exceptional
cases considered, in which the crossed plants did not exceed
greatly in height the self-fertilised—Most of these cases shown
not to be real exceptions to the rule that cross-fertilisation is
beneficial—Summary of results—Relavive weights of the
crossed and self-fertilised plants Page 238-284

CHAPTER VIII.

DIFFERENCE BETWEEN CROSSED AND SELF-FERTILISED PLANTS IN CONSTITUTIONAL VIGOUR AND IN OTHER RESPECTS.

Greater constitutional vigour of crossed plants—The effects of great crowding—Competition with other kinds of plants—Self-fertilised plants more liable to premature death—Crossed plants generally flower before the self-fertilised—Negative effects of intercrossing flowers on the same plant—Cases described—Transmission of the good effects of a cross to later generations—Effects of crossing plants of closely related parentage—Uniform colour of the flowers on plants self-fertilised during several generations and cultivated under similar conditions.

285-311

CHAPTER IX

THE EFFECTS OF CROSS-FERTILISATION AND SELF-FERTILISATION ON THE PRODUCTION OF SEEDS.

Fertility of plants of crossed and self-fertilised parentage, both lots being fertilised in the same manner—Fertility of the parentplants when first crossed and self-fertilised, and of their crossed



CONTENTS.

vii

and self-fertilised offspring when again crossed and self-fertilised — Comparison of the fertility of flowers fertilised with their own pollen and with that from other flowers on the same plant — Self-sterile plants — Causes of self-sterility — The appearance of highly self-fertile varieties — Self-fertilisation apparently in some respects beneficial, independently of the assured production of seeds — Relative weights and rates of germination of seeds from crossed and self-fertilised flowers ... Page 312-355

CHAPTER X.

MEANS OF FERTILISATION.

CHAPTER XI.

The Habits of Insects in relation to the Fertilisation of Flowers.

Insects visit the flowers of the same species as long as they can—Cause of this habit—Means by which bees recognise the flowers of the same species—Sudden secretion of nectar—Nectar of certain flowers unattractive to certain insects—Industry of bees, and the number of flowers visited within a short time—Perforation of the corolla by bees—Skill shown in the operation—Hive-bees profit by the holes made by humble-bees—Effects of habit—The motive for perforating flowers to save time—Flowers growing in crowded masses chiefly perforated.

415-435



viii

CONTENTS.

CHAPTER XII.

GENERAL RESULTS.

Cross-fertilisation proved to be beneficial, and self-fertilisation injurious — Allied species differ greatly in the means by which cross-fertilisation is favoured and self-fertilisation avoided — The benefits and evils of the two processes depend on the degree of differentiation in the sexual elements — The evil effects not due to the combination of morbid tendencies in the parents — Nature of the conditions to which plants are subjected when growing near together in a state of nature or under culture, and the effects of such conditions — Theoretical considerations with respect to the interaction of differentiated sexual elements — Practical lessons — Genesis of the two sexes — Close correspondence between the effects of cross-fertilisation and self-fertilisation, and of the legitimate and illegitimate unions of heterostyled plants, in comparison with hybrid unions Page 436–469

INDEX Page 471—482

ERRATA.

PAGE

35, Table VI., bottom of second column, for "495.13" read "495.25."

121, twelve lines from bottom of page, for "fertilised" read "self-fertilised."

162, Table LVII., bottom of third column, for "158.76" read "158.75."