Original article

Pollination requirements of loquat (*Eriobotrya japonica* Lindl.), cv. 'Algerie'

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Pollination requirements of loquat (*Eriobotrya japonica* Lindl.), cv. 'Algerie'.

Abstract — Introduction. Loquat shares with other pomes, such as apple (*Malus domestica*) and pear (*Pyrus communis*), flowering habits, but, in contrast with them, the tree is considered a self-compatible species. However, when planted in solid blocks under mesh, low fruit set and small fruit size are often reported. To explore in which way restrictions of bee activity and/or impediments for cross-pollination can be responsible for low productivity and poor fruit quality, we carried out controlled pollination on flowers of loquat cv. Algerie. **Materials and methods**. A first experiment checked cross-pollination response by comparing fruit set and quality from self-, open-, and cross-pollinated flowers. A second experiment explored poor pollination effects by modifying the number of stigmas being hand cross-pollinated. **Results**. Cv. Algerie loquat flowers cross-pollinated with pollen of cvs. 'Tanaka' and 'Golden Nugget' loquat flowers produced more fruits of higher quality (larger, heavier and more precocious) than flowers under self-pollination. Benefits of cross-pollination can be explained by an earlier and higher level of fertilization. Observations under microscopy showed, however, that self-incompatibility of cv. Algerie flowers is not complete, and a certain level of self-fertilization occurs. The second experiment demonstrated that limiting the number of stigmas pollinated resulted in a significant reduction in the number of seeds formed that, in turn, affected fruit size and shape. Flowers with only one stigma pollinated seldom formed more than two seeds while flowers with all five stigmas pollinated produced fruit with an average of four seeds. **Conclusion**. Our results emphasize a dependence of cv. Algerie flower pollination on both adequate activity of pollinator insects and appropriate placement of pollinizers.

Spain / *Eriobotrya japonica* / pollination / pollinators / pollinizers

La pollinisation du néflier du Japon (*Eriobotrya japonica* Lindl.), cv. 'Algérie'.

Résumé — Introduction. Le néflier du Japon a le même type de floraison que d'autres fruitiers à pépins, comme le pommier (*Malus domestica*) ou le poirier (*Pyrus communis*), mais, contrairement à ces arbres fruitiers, l'espèce *Eriobotrya japonica* est considérée comme autocompatible. Cependant, plantés en blocs complets sous filet, les arbres présentent une faible nouaison et produisent des fruits de petites tailles. Pour étudier dans quelle mesure une diminution de l'activité des abeilles et/ou des empêchements de pollinisation croisée pouvaient être responsables de la faible productivité et de la pauvre qualité du fruit, nous avons effectué une pollinisation contrôlée sur des fleurs de néflier du Japon du cv. Algérie. **Matériel et méthodes**. Une première expérimentation a cherché à vérifier l'efficacité de la pollinisation croisée en comparant la nouaison et la qualité des fruits obtenus par autopollinisation, libre pollinisation et pollinisation croisée. Une seconde expérimentation a étudié les effets d'une faible pollinisation en modifiant le nombre de stigmates pollinisés à la main. **Résultats**. Les fleurs du néflier du Japon cv. Algérie interfécondées par du pollen des cvs. 'Tanaka' et 'Golden Nugget' ont produit des fruits plus nombreux et de meilleure qualité (plus gros, plus lourds et plus précoces) que les fleurs autopollénisées. Les avantages de la pollinisation croisée se sont exprimés par une fertilisation plus précoce et plus importante. Les observations sous microscope ont montré cependant que l'auto-incompatibilité du néflier du Japon cv. Algérie n'était pas complète, et qu'un certain niveau d'autofertilisation avait lieu. La deuxième expérimentation a démontré qu'une limitation du nombre de stigmates pollinisés réduisait significativement le nombre de graines formées ce qui, ensuite, affectait la dimension et la forme de fruit. Les fleurs avec seulement un stigmate pollinisé ont rarement formé plus de deux graines, alors que les fleurs avec cinq stigmates pollinisés produisaient des fruits contenant en moyenne quatre graines. **Conclusion**. Nos résultats ont mis en évidence que la pollinisation des fleurs du néflier du Japon cv. Algérie dépendait à la fois des insectes pollinisateurs et de la localisation des arbres pollinisateurs.

Espagne / *Eriobotrya japonica* / pollinisation / pollinisateur

1. Introduction

Loquat (*Eriobotrya japonica* Lindl.) is a subtropical evergreen tree of the Rosaceae family and Maloideae (formerly Pomoideae) subfamily; it shares with other pomes flower design and fruit type. Its flowers, aggregated on panicles located on the current season's wood, present the typical pentamerous symmetry of this family. Each flower has five sepals, five petals, five stigmas, and around twenty stamens. Its gynoecium also presents five carpels, each one with two ovules, ten ovules in total [1]. Loquat fruit is a pome that includes a variable number of large seeds, usually from one to five [2, 3]. In Spain, loquat bloom lasts for around 4 weeks although the lifespan of a single flower is limited to 5–7 d, before petals wilt [4].

In contrast with other pomes such as apple (*Malus domestica*) or pear (*Pyrus communis*), loquat is mostly considered a self-compatible species [4, 5]. However, loquat flowers strongly attract pollinators that obtain a high reward for their visits in the form of pollen and nectar [6]. Furthermore, loquat flowers are very showy and fragrant: their odor can be perceived meters away from the source. Although those plant investments in pollinator attraction do not preclude a recent acquisition of self-compatibility, they are better understood in the context of preferential allogamy as the reproductive system for loquat.

China is the main producer for loquat, although Spain accounts for more than 84% of loquat fruit exported worldwide. In Spain, 'Algerie' is the main cultivar with more than 50% of acreage [7]. 'Algerie' is being increasingly planted in Spain in solid blocks under mesh to gain some earliness and avoid fruit skin bruises caused by wind. Under these conditions, bee activity and pollen transfer from other genotypes is often constrained [8] and reports of low fruit set and small fruit size are becoming common. Previous experiences have shown us that seed number exerts a strong influence on loquat fruit size and that a high proportion of fruit harvested in a solid orchard of 'Algerie' included only one seed despite the relentless activity of honey bees [9]. Considering such information, the pollination requirements of 'Algerie' loquat were evaluated. Two main objectives were pursued. First, we checked dependence on pollinizers by studying cross-pollination response in terms of fruit set and quality and pollen-pistil interaction; secondly, we checked the effects of pollen distribution on one versus five stigmas of the loquat flowers as a way to explore the dependence of loquat on the activity of pollinators.

2. Materials and methods

Two experiments were carried out on 23-year-old trees of 'Algerie' loquat. The trees, grafted on Provence quince, were growing in a solid block in a 1500 m^2 area; a number of 'Tanaka' and 'Golden Nugget' loquat trees were growing in a different block about 100 m distant from the 'Algerie' trees. Both orchards are located in *Las Palmerillas* experimental station near El Ejido (Almería, SE Spain), 2 km from the Mediterranean sea. The Algerie trees were vase-trained, spaced at (6 × 4) m and in an East-West orientation. The orchards are conduced under non-tillage. The climate of the area is mild and dry with an average temperature of 18.3 °C, minimum mean of 14.1 °C, and maximum mean of 23.0 °C. Annual rainfall is limited to 220 mm while evapotranspiration reaches 1726 mm; water needs were supplied by drip irrigation.

2.1. Cross-pollination response

A first experiment checked cross-pollination response by comparing fruit set and quality from self-, open-, and cross-pollinated flowers. In this trial, flowers were either self- or cross-pollinated by applying appropriate pollen with a small brush. Self-pollinated flowers were copiously covered with their own pollen; cross-pollinated flowers received a mixture of fresh just-collected pollen from cvs. Tanaka and Golden Nugget flowers. Unwanted pollinations were prevented by bagging with microperforated polyethylene sacs (Cryovac Packaging, Spain), previous to bloom. All flowers formed in four panicles in each of four different trees were hand-pollinated in these two treatments. Pollination was performed every day on newly opened flowers. The first pollination was done on 23rd of November, the last on December 9th. On those shoots, the number of fruits set per panicle was determined at the end of experiment.

Open-pollinated flowers, left exposed to bee activity, served as controls. The closest beehives were in fact located on greenhouses 500 m distant.

Harvest was done when the first fruits showed full color and it was performed on the same day, 17th of April, for all fruits, irrespective of their stage of development. Therefore, some fruits were collected before completion of their development, especially under self-pollination treatment.

Fruit size and total soluble solids (TSS) content were estimated for every harvested fruit. Fruit size was estimated by fruit diameter and fruit weight. TSS was determined at experimental harvest with a digital refractometer and expressed as °Brix. The [pulp/seed] ratio was calculated by dividing pulp thickness by space occupied by seeds. The number of seeds per fruit was also recorded. Finally, fruit shape was estimated as the [fruit diameter/fruit length] ratio.

The experimental design corresponded to randomized blocks where every tree in four acted as a repetition and block each bearing twelve panicles, four per pollination treatment. Analyses of variance and separation of means by Duncan's test were performed using the Statgraphics Plus 4.0 software.

Pollen-pistil interaction was studied by fluorescence microscopy on a different sample of flowers either self- or cross-pollinated as above on their day of anthesis. Open-pollinated flowers were tagged and left simply exposed to insect visitors. Pollen adhesion, germination and pollen tube growth were followed on 20 flowers per treatment and date. Flowers were collected (1, 2, 4 and 8) d after pollination. The level of fertilization was calculated on a flower level, that is, percentage of flowers with at least one ovule penetrated by pollen tubes, and also considering the percentage of ovules (ten ovules exist per flower) penetrated by pollen tubes.

The fluorescence microscopy procedure resulted from a slight modification of Martin's [10] proposal and it was as follows: pollinated flowers were collected and fixed in FAA (formalin, acetic acid and ethanol at 70%, 1:2:17 by volume), rinsed in tap-water for 24 h, softened for 6 h in NaOH 0.8 N and rinsed again with water for 8 h. Pistils were then stained with aniline blue 0.1% in phosphate buffer at pH 11.5 and gently squashed. Observations were made under ultraviolet light using a fluorescence microscope.

2.2. Pollen distribution effects

A second experiment explored effects of pollen distribution by modifying the number of stigmas being hand cross-pollinated. The treatments were one-stigma pollinated (the other four were removed) and all five stigmas pollinated. Negative effects such as flower abscission or stigma browning were not obvious in response to stigma removal. To avoid accidental self-pollination, 40 flowers per treatment were emasculated at the late balloon stage and bagged. Pollination was performed next day, December 3rd, corresponding to anthesis, with a mixture of fresh pollen of Tanaka and Golden Nugget flowers. Four days later, samples of 20 flowers per treatment were collected to check pollen-pistil interaction processes. Another 20 flowers per treatment were allowed to reach harvest, when fruit set, quality and seed number were determined as above.

3. Results

3.1. Cross-pollination response

Fruit set was significantly higher for open- and cross-pollination treatments ($p < 0.001$). Fruit set under self-pollination was extremely low, with an average close to one fruit per panicle. On the contrary, fruit set was very high for cross- (16.9 fruits per panicle) and open-pollination (11.6 fruits per panicle). Despite a higher fruit set in cross- and open-pollinated panicles than in

Table I.
Fruit quality of loquat (*Eriobotrya japonica* Lindl.), cv. 'Algerie' under different pollination treatments.

Treatment	Diameter (mm)	Fresh weight (g)	Number of seeds	[Pulp/seed] ratio	Total soluble sugars (° Brix)
Self-pollination	30.36 b	18.84 c	1.04 c	1.27 a	8.20 a
Open-pollination	36.35 a	32.24 a	1.74 b	1.09 a	8.98 a
Cross-pollination	34.89 a	28.88 b	2.58 a	1.08 a	10.55 a

Means followed by the same letter in the column do not differ by Duncan's test (5%).

self-pollinated ones, fruit size was also greater in these treatments, at least in part due to a higher number of seeds per fruit (*table I*). This was true for fruit diameter as well as for fresh fruit weight.

For fresh fruit weight, we found differences between open- and cross-pollination, higher for the former than for the latter, possibly due to its lower set. Open- and cross-pollination also led to higher TSS content (*table I*), making compatible a high level of fruit set and better fruit size with improved earliness. Differences in TSS were not significant, in part due to the small sample size under self-pollination. The number of seeds per fruit, that reflects the efficiency of pollen transfer and fertilization, was significantly different between treatments. Open-pollinated flowers formed more seeds than self-pollinated ones, but less than flowers that were hand cross-pollinated (*table I*), although bees and bumblebees were often seen in frenetic activity on open-pollinated flowers. Finally, no variation ($p = 0.33$) was found in the [pulp/seed] ratio, indicating that although fruits from cross- and open-pollination were larger, their seeds were also more numerous and larger. No significant differences were found between the different trees that acted as blocks for any of the measured parameters.

To determine the importance of seed number on fruit characteristics of cv. Algerie loquat, harvested fruits were classified independently of pollination treatment and we analyzed the relationships between seed number, fruit size, shape and TSS content. Fruits with one or two seeds were the most common (*table II*). However, a significant proportion of fruits had three or four seeds. A low number of fruit with five to eight seeds were also formed. Fruit increased in diameter, length and weight according to seed number, at least up to three seeds per fruit (*table II*). Pulp thickness also increased initially, with up to three seeds per fruit; no clear trend can be forecasted further. On the contrary, the [pulp/seed] ratio seemed to decrease with seed number. Finally, seed number affected fruit shape, as fruit became rounder with the increase in seed number (*table II*).

Pollen-pistil interaction analyses showed good and widespread pollen adhesion and germination for all treatments. Only in the open-pollination treatment did some flowers collected during the first few days not present pollen, reflecting dependence on bee activity. Although a precise estimation was not made, the number of pollen grains on the pistil surface seemed to be inferior for open-pollination. Delayed pollination under open-pollination did not preclude fruit formation, although the fertilization level was lower and the date belated (*table III*). Observations under microscopy showed that self-incompatibility of cv. Algerie loquat is not complete, because ovule penetration by pollen tubes could be seen in a high proportion of self-pollinated flowers (*table III*). Pollen adhesion and germination was high under self-pollination

Table II.
Characteristics of fruits of loquat (*Eriobotrya japonica* Lindl.), cv. 'Algerie', based on seed number (mean ± standard error).

Seed number	Number of fruits	Diameter (mm)	Length (mm)	[Diameter/ length] ratio	Pulp thickness (mm)	[Pulp/seed] ratio	Weight (g)
0	17	27.1 ± 1.1	32.5 ± 1.2	1.21	7.6 ± 0.3	1.34	13.6 ± 1.4
1	120	31.9 ± 0.4	39.0 ± 0.6	1.22	8.4 ± 0.2	1.14	22.7 ± 0.9
2	168	35.9 ± 0.3	41.3 ± 0.4	1.15	9.1 ± 0.2	1.09	30.9 ± 0.9
3	95	37.6 ± 0.4	42.5 ± 0.6	1.13	9.4 ± 0.2	1.06	34.8 ± 1.2
4	47	37.9 ± 0.7	41.5 ± 0.8	1.10	8.9 ± 0.3	0.91	35.2 ± 2.0
5	16	37.9 ± 1.4	42.5 ± 1.2	1.14	9.4 ± 0.4	1.21	38.2 ± 4.0
6	2	39.2 ± 0.8	42.6 ± 4.2	1.08	9.0 ± 1.0	0.88	35.3 ± 1.5
7	1	41.54	42.29	1.02	7.82	0.60	45.3
8	1	38.71	45.79	1.18	10.92	1.29	38.8

Table III.
Fertilization percentages of loquat (*Eriobotrya japonica* Lindl.) cv. 'Algerie' flowers under different pollination treatments at ovule level, each flower containing 10 ovules, and at flower level. Sample of 20 flowers per date and treatment.

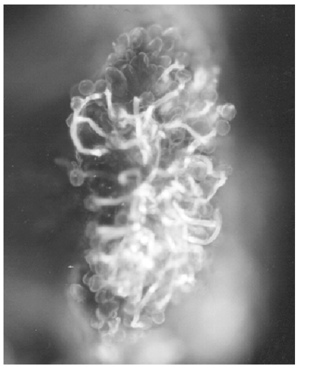
Treatment	Fertilized ovules (%)				Fertilized flowers (%)			
	Days after pollination							
	1	2	4	8	1	2	4	8
Self-Pollination	0	1.5	6.0	15.3	6.1	41.1	74.4	96.4
Open-Pollination	1.0	4.0	10.0	18.6	0	15.0	46.7	96.1
Cross-Pollination	0.5	21.4	23.1	24.8	10.6	100	100	100

(*figure 1*) and unaffected by pollination treatments. However, under self-pollination, pollen tubes reached ovules later than under hand cross-pollination, and fertilization was commonly limited to one ovule per flower, more rarely two.

3.2. Pollen distribution effects

Limiting the number of stigma pollinated in loquat flowers resulted in a reduction in the number of seeds formed, but no effect was observed on fruit set. In both treatments the same proportion of flowers became fruits: 17 fruits out of 19 flowers, one flower missing in both cases. However, reproductive success was higher when we applied pollen to all five stigmas. In this treatment, fruits averaged 4.04 seeds, while treatment with only one stigma pollinated presented fruits with an average of 1.96 seeds (*figure 2*). Fertilization was observed under microscopy on 18.7% and 8.2% of the ovules, respectively, 4 d after pollination. On that

Figure 1.
Pollen adhesion and germination in self-pollinated loquat (*Eriobotrya japonica* Lindl.) cv. 'Algerie' flower under fluorescence microscopy.



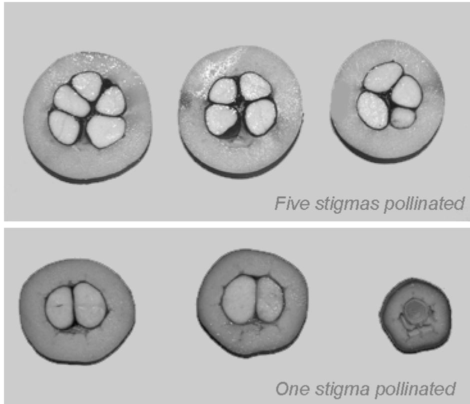


Figure 2.
Representative samples of loquat (*Eriobotrya japonica* Lindl.) cv. 'Algerie' fruits equatorially sectioned, (above) from flowers with all five stigmas cross-pollinated, (below) from flowers with one stigma cross-pollinated. Observe differences in fruit size, ripening and seed number.

date, the ovules looked good and healthy since 96.5% and 98.0%, respectively, were labeled as viable based on their appearance and fluorescence [11]. The number of seeds per fruit had in turn a clear impact on fruit size, shape and ripening. Fruit from one-stigma-pollinated flowers reached a diameter of 34.6 ± 1.1 mm versus 38.3 ± 1.4 mm for fruit originated from flowers with all five stigmas pollinated. Differences in weight were greater; fruits from flowers with all stigmas pollinated averaged 35.7 ± 3.5 g versus 25.5 ± 1.9 g for flowers with only one stigma pollinated. Ripening was also advanced: 8.7 °Brix versus 7.4 °Brix, depending on the number of stigma pollinated. Different seed numbers also had an impact on fruit shape. Fruits with more seeds presented a rounder shape ([length/width] ratio = 1.07), and, conversely, fruits proceeding from flowers with one stigma pollinated, less seeded, were more elliptical ([length/width] ratio = 1.16).

4. Discussion

Loquat is often referred to as a self-compatible species [4]. In fact, this crop commonly sets an excessive number of fruit per panicle, forcing some kind of fruit thinning [12]. The high capacity of loquat to set fruits, even in isolated backyard trees, has made researchers assume full self-compatibility for all cultivars [5]; however, there exist some discrepancies. McGregor, in his classic book about insect pollination of cultivated plants [6], indicated that most loquat cultivars benefit from cross-pollination, some of them being totally dependent on it. Morton [3] and Oppenheimer and Reuveni [13] also reported an increase in yield for some loquat cultivars under cross-pollination, although differences between cultivars exist and some others behave as if self-compatible. Crescimmano [14] has done the most extensive study on loquat pollination and stated that under self-pollination most cultivars set a percentage of flowers close to that achieved in unbagged flowers. However, his data do not support such conclusions at all, since his data showed a very positive response to cross-pollination in most Italian loquat cultivars, some of them unable to set any fruit under self-pollination. Our results show that cv. Algerie loquat formed very few fruits when it was self-pollinated. On the contrary, a very high fruit set was obtained under cross- and open-pollination. A positive response to cross-pollination coincides with reports of low fruit set for a clone of Algerie named Cardona. However, our results contradict the pollination management by Spanish growers who usually do not include pollinizers or place beehives in their loquat orchards.

Our results also showed that fruit of cv. Algerie loquat obtained under cross-pollination were heavier and larger than those formed under self-pollination. These effects could be at least partly due to a significant increase in seed number. Heavier fruits can also result from the influence of heavier seeds, as has been reported in lychee and avocado [15, 16]. Our microscopic observations demonstrated that self-fertilization occurred later than cross-pollination and that it was often limited to one or two ovules per flower. This explains why fruit produced by self-pollination contained only one or two seeds. In agreement with that, previous harvests in the same orchard, before other cultivars were planted in proximity, produced up to 65% fruits with only one seed, and 30% with two seeds [9]. This situation was reverted when cvs. Tanaka and Golden Nugget loquat trees were placed around the Algerie trees. Therefore, although self-fertilization is not completely precluded, cv. Algerie loquat must be considered at least as a partially self-incompatible cultivar. The proximity of cvs. Tanaka and Golden Nugget trees to the cv. Algerie orchard and frenetic activity of bees suggest that open-pollinated flowers were in fact cross-pollinated. High fruit set and seed set under open-pollination also evokes cross-pollination; however, the better efficiency of pollinators transferring self-pollen than the efficiency of hand self-pollination cannot be ruled out, since stigma receptivity seemed to be improved after the first day of anthesis (Puertas pers. comm.).

No differences were evident in pollen adhesion or pollen germination in our experiments. Oppenheimer and Reuveni [13] made limited observations of pollen-pistil interaction on cv. 'Acre 13' loquat. They detected a strong restriction in pollen tube growth in incompatible crosses. Although pollen-pistil interactions in loquat have not been previously analyzed in detail, other members of the Maloideae subfamily also show a partial or complete rejection of their own pollen, expressed during the growth of pollen tubes through the style [17–19].

Though the number of ovules penetrated by pollen tubes roughly coincided with the number of seeds per fruit under self-pollination, measured fertilization at flower level (up to 75% of the flowers four days after pollination; *table III*) was in contradiction with the low fruit set (0.9 fruits per panicle) observed in this treatment. This disagreement has no easy explanation, but suggests an embryo abortion process. In fact, empty seeds with rudimentary seed coats were often seen in harvested fruits of this treatment (*figure 3*). An alternative explanation is that ovule penetration by pollen tubes is not necessarily followed by discharge of male gametes, since pollen tubes on their way towards the embryo sac must cross through an obturator and two integuments. In any case, ovule penetration by pollen tubes in this treatment did not guarantee fruit setting.

Fruits with more seeds reached a larger size, were more precocious and adopted a more spherical shape, deduced from their [diameter/length] ratio (*table II*). In general, a rounder shape results in better consumer acceptance, adding unexpected value to the increase in seed number. However, despite easy removal, more seeds per fruit is itself a negative character from the point of view of the consumer [2]. Although the strong influence of seed number on the loquat fruit size is well known, a limit to this influence has yet to be established. Our results suggest that fruit with three or four seeds will reach full growth potential whenever standard horticultural care is provided. Fruit with more than four seeds scarcely increased their size. Our results suggest that the variable number of seeds and different fruit shape often reported for different cultivars may be in some measure due to pollination conditions. We suggest therefore that characterization of loquat cultivars or selection must be achieved under uniform cross-pollination conditions such as those present in germplasm collections.

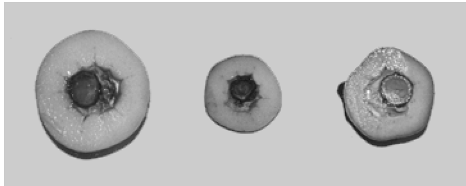


Figure 3.
Cross-sectioned fruits of loquat (*Eriobotrya japonica* Lindl.), cv. 'Algerie', proceeding from self-pollinated flowers. Observe common seed abortion.

The second experiment demonstrated that a reduction in the number of stigma pollinated in loquat flowers resulted in a significant decrease in the number of seeds developed, that in turn affected fruit size and earliness. Flowers in which only one stigma received pollen rarely developed more than two seeds, suggesting that pollen tubes do not transverse different locules. Pollen grains applied to one stigma formed tubes that mostly entered correspondent carpels. Therefore, fertilization was limited to the two ovules included there. In contrast, when all stigmas were heavily pollinated, fruits formed an average of 4.04 seeds. In addition, some fruits included more than five seeds, indicating that in some cases the two ovules of some carpels were transformed into seeds. This means that both ovules are capable of forming seeds, and no substitutive role for the second ovules can be assigned to them, as has happened for some drupes of the subfamily Prunoideae [20]. Smock [1] confirms that apparently all ten ovules of loquat develop normal gametophytes. Nonetheless, when potential is higher and no pollen limitation present, the average of four seeds per fruit observed suggests some kind of competition between developing seeds. This was revealed by different seed sizes when more than three or four seeds were formed. In this sense, Smock [1] indicates that two seeds seldom develop in the same carpel; but, where they do, one seed soon supersedes the other.

Our results also emphasize the importance of uniform pollen distribution among stigmas to achieve a large fruit size. In this respect, regular and repetitive visits of bees may have a strong influence on fruit size, although we have not seen an effect of the number of stigmas pollinated on fruit set. Reports of small fruit size, when loquat is cultivated under mesh, may reflect difficulties for pollen transfer. In this sense, Khan *et al.* [21] observed the full dependence of an unidentified loquat cultivar on bee activity, with extremely low fruit set and reduced fruit weight for bagged flowers, compared with flowers pollinated by bees. Oppenheimer and Reuveni [13] detected that natural selfing is not as effective as artificial selfing (the procedure followed here) for full fruit set, and concluded that bee activity may be an advantage even for compatible cultivars.

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Requerimientos de polinización del níspero del Japón (*Eriobotrya japonica* Lindl.), cv. 'Algerie'.

Resumen — **Introducción**. El níspero del Japón tiene el mismo hábito de floración que otros frutales de pepitas como el manzano (*Malus domestica*) o el peral (*Pyrus communis*) pero, al contrario de estos árboles, la especie *Eriobotrya japonic*a es considerada autocompatible. Sin embargo, cuando es plantada en bloques monovarietales bajo malla, los árboles muestran una baja tasa de fructificación y dan frutos pequeños. Para estudiar en qué medida la disminución de la actividad de las abejas o las barreras a la polinización cruzada pueden ser responsables de la baja productividad y la pobre calidad de la fruta, efectuamos una polinización controlada en flores de níspero del Japón cv. Algerie. **Material y métodos**. El primer experimento tuvo como objetivo verificar la respuesta a la polinización cruzada, comparando la fructificación y la calidad de los frutos obtenidos mediante autopolinización, polinización libre y polinización cruzada. El segundo experimento estudió los efectos de una pobre polinización modificando el número de estigmas polinizados a mano con polen compatible. **Resultados**. Las flores del níspero del Japón cv. Algerie, polinizadas con polen de los cvs. 'Tanaka' y 'Golden Nugget', produjeron frutos más abundantes y de mejor calidad (más gruesos, más pesados y más precoces) que las flores autopolinizadas. Las ventajas de la polinización cruzada se explican por un nivel de fecundación mayor y más precoz. Las observaciones con microscopio revelaron, sin embargo, que la autoincompatibilidad del níspero del Japón cv. Algerie no es completa y que existe un cierto nivel de autofecundación. El segundo experimento demostró que la limitación del número de estigmas polinizados reducía significativamente el número de semillas formadas lo que, a su vez, repercutía en el tamaño y la forma del fruto. Las flores con un único estigma polinizado raramente formaron más de dos semillas, mientras que las flores con cinco estigmas polinizados produjeron frutos con un promedio de cuatro semillas. **Conclusión**. Nuestros resultados enfatizan la dependencia de las flores del níspero del Japón cv. Algerie tanto de los insectos polinizadores como de la presencia de pies polinizadores.

España / *Eriobotrya japonica* / polinización / polinizadores

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