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FIRST INFORMATION ABOUT TWO ASIAN PEAR COLLECTIONS IN FRANCE

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Abstract

A collection of 23 Asian pear varieties was established during the 83/84 winter in two sites in France : Angers and Bergerac. The trees had been budded on seedlings of *Pyrus serotina* and *Pyrus calleryana*.

The pedo-climatic situations, the first results on the behaviour of the trees, vigour and first bearing are provided.

Observations carried on blooming period, thinning, picking date, number and weight of fruits. A description of the aspect and quality is given as storage capacity.

Introduction

Fruit tree research station in Angers introduced in 1981 from Fruit tree research station Yatabe, Ibaraki in Japan 18 Japanese pear varieties. In August 1982 they were budded on seedlings of *Pyrus serotina* and *Pyrus calleryana* (D.6 selection). Four Chinese varieties and the Japanese pear 'Okusankichi' were added. (table 1).

During the winter 1983/1984 one tree of each combination was planted in Angers (Loire valley) and in Bergerac (South-West of France) on the experimental farm of CTIFL. The characteristics of the soil and climate are shown in table 2. Irrigation is established on both sites.

Results

Generally speaking the affinity was good to very good and the budding was successful on the two types of rootstocks. It was possible to establish, in nursery, a classification according to the girth of the trunk and the height of the maiden trees. (table 3).

It was possible to note :

- for girth of the trunk : 13 varieties were classed above 56 mm with *Pyrus serotina* and 10 with *Pyrus calleryana*. On the contrary 10 were classed below 56 mm with *Pyrus calleryana* and 6 only with *Pyrus serotina*.
- for the height of maiden trees : 10 varieties were above 1.50 m with *Pyrus serotina* and 7 with *Pyrus calleryana*. On the opposite side 12 varieties were classed below 1.50 m with *Pyrus calleryana* and 10 with *Pyrus serotina*.

It seems, on the whole, that seedlings of *Pyrus serotina* gave a better vigour, in nursery, than seedlings of *Pyrus calleryana*.

In Angers the trees were planted obliquely (flag form on treillis). In Bergerac they were planted in free spindle axis.

First flowers came very quickly, as soon as 1985 for the majority of the varieties. The flowering time in 1985, 1986 and 1987 was very late ; so the number of flowering days was limited. In 1988 this number of days was larger : from March 21st until April 16th. The table 4 gives the **order of flowering time** in Angers and Bergerac for 1988. Some varieties as 'Nijisseiki' 'Shinko' - 'Suisei' had a long period of flowering. In Angers twelve varieties bloomed before 'Passe Crassane'. Ten bloomed at the same period and only one bloomed after. In Bergerac eight varieties bloomed before 'Williams', ten bloomed at the same period. Only 'Kimizuka Wase' - 'Choju' - 'Okusan-kichi' and 'Kumoi' bloomed after.

After three years of growing the vigour which was better on *Pyrus serotina* in the nursery was a little better on *Pyrus calleryana* in Angers but this is not so clear in Bergerac. In Angers the range was :

Three varieties were weak : 'Hakko' - 'Kikusui' - 'Yakumo'

Seven were of medium vigour : 'Hayatama' - 'Hosui' - 'Kimizuka Wase' - 'Kumoi' - 'Niitaka' - 'Shinsui' - 'Suisei'.

Three of medium to strong vigour : 'Choju' - 'Chojuro' - 'Tama'.

Five of strong vigour : 'Kosui' - 'Nijisseiki' - 'Ping Guo Li' - 'Shinseiki' - 'Xue Hua Li'.

Three of very strong vigour : 'Imamura Aki' - 'Jing Bai Li' - 'Ya Li'.

In Bergerac the range was approximately the same except 'Hosui' and 'Suisei' which were stronger and 'Choju' and 'Imamura Aki' which were weaker.

It was difficult to class the variety 'Shinko' which was of medium vigour on *Pyrus serotina* and much more vigourous on *Pyrus calleryana*.

Table 5 shows an example of the progression of the production in Angers for four important varieties. Production on *Pyrus calleryana* was generally greater than on *Pyrus serotina* and this is true for the two sites.

Classes of the **amount of production** until 1987 included, are shown in table 6 for Angers. The figures for Bergerac were approximately the same. Extremes were in Angers from 4.8 kg ('Hakko') to 37.0 kg ('Imamura Aki') for trees on *Pyrus serotina* and from 4.3 kg ('Yakumo') to 52.2 kg ('Imamura Aki') for trees on *Pyrus calleryana*.

In Bergerac they were from 5.6 kg ('Hakko') to 42.0 kg ('Xue Hua Li') for trees on *Pyrus serotina* and from 3.4 kg ('Jing Bai Li') to 47.0 kg ('Shinseiki') for trees on *Pyrus calleryana*.

It must be noted that Chinese varieties bear fruit one year later than Japanese one.

Picking time (table 7) ranked from beginning of August (6th in Bergerac, 10th in Angers) to mid of October, the earliest being 'Hayatama' and the latest 'Imamura Aki' and 'Okusankichi'. It is difficult to give a precise date, for the maturity on the tree is often spread.

The mean weight of the fruits is very variable according to picking time and mainly according to the intensity of thinning. It is possible, also, that the temperatures influence on this characteristic ; so, it could be greater in warmer conditions so long as water is provided enough.

In Angers two varieties had very big fruits : 'Imamura Aki' and 'Xue Hua Li' (about 300 g).

- three had big fruits : 'Chojuro' - 'Niitaka' - 'Ping Guc Li' (about 180 g).
- seven varieties had medium fruits : 'Hosui' - 'Kikusui' - 'Kimizuka Wase' - 'Kosui' - 'Kumoi' - 'Shinko' - 'Ya Li' (about 150 g).
- seven had small fruits : 'Choju' - 'Hakko' - 'Hayatama' - 'Nijisseiki' - 'Shinseiki' - 'Suisei' and 'Tama' (about 125 g).
- three had very small fruits : 'Jing Bai Li' - 'Shinsui' - 'Yakumo' (about 100 g).

In Bergerac, mean weight of fruits was generally greater, the smallest : 'Jing Bai Li' - 'Hayatama' and 'Kimizuka Wase' weighing about 120 g.

It is possible that the thinning had been more severe in Bergerac. Thinning is a very important work for Asian pears. For five principal varieties, the evolution of flower buds all along the year 1987 in Angers is given in table 8.

Intensity of thinning can be measured by the number of clusters remaining after this operation (May and beginning of June). Percentage of removed clusters (col. 3) varies between 40 to 50 %. Number of removed fruits (col. 4) varies between 200 and 400. Generally only one fruit by clusters stayed at the picking time. However for 'Chojuro' on *Pyrus serotina* one can find out a deficiency in the thinning leading to 1.73 fruits by cluster and an average weight of 115 g. In order to tend towards a commercial size it is important to keep only one fruit by cluster.

Quantity of flower buds initiated during the 1987 summer varies from 170 to 694. It is 'Chojuro' which formed the greater number as well on *Pyrus serotina* as *Pyrus calleryana*.

Winter pruning leads already to a first thinning and the percentage of flower buds remaining after pruning varies from 23 % to 39 % for 'Chojuro' 'Hosui' and 'Kosui' to 52 to 91 % for 'Choju' and 'Nijisseiki', two spur type varieties on which pruning is less heavy. This is confirmed by the percentage of flower buds located on one year old wood. It is from 30 to 69 % on the three first varieties and only from 7 to 14 % on the two last ones. 'Kikusui' and 'Shinko' are also of spur type. On the other hand 'Hosui' - 'Kosui' and 'Shinsui' are lateral types.

After four years of growth it is possible to draw up some **characteristics useful for the management of the trees.**

'Choju' : Thick and rigid one year old shoots bearing some flowers. Good balance between growth and fruiting habit. Many bourses present flowers for the next year. Good reaction to shortening.

'Chojuro' : Rather good branching. Good balance. Good reaction to shortening of lateral shoots. Flowers on bourses and on annual wood. Long shoots.

'Hayatama' : Rather good branching. Good reaction to shortening of lateral shoots but few flowers on bourses. Flowers on annual wood but only at the top.

'Hosui' : Some flowers on one year old shoots. Some flowers on bourses and twigs. Possibility of biennial bearing. Good reaction to shortening.

'Kimizuka Wase' : Few flowers on one year old shoots and on bourses. Tendency to be bare at the bottom of the tree. Flowers on dards.

'Kosui' : Long rigid and brittle shoots. Flowers mainly on dards and on annual wood. Spur can't be used for a long period.

'Kumoi' : Flowers on one year old shoots but only at the top. New shoots only by cutting back. Bourses without flowers. Rough bark.

'Nijisseiki' : Flowers on one year old shoots and on bourses. Spurs are flowering and fruiting many years. Shoots are not numerous.

'Shinko' : Good balance between one year old shoots and twigs. Good reaction to shortening. Some flowers on annual shoots. Difficulty of renewal.

'Shinseiki' : Good balance between spurs and one year old shoots, only lateral shoots bear flowers. Good reaction to shortening.

'Shinsui' : Weak branching. Difficulty to regenerate new growth. No flowers on bourses. Old bourses become dry. Few flowers on annual shoots. Flowers mainly on two year old shoots.

Attractiveness of the fruit is certainly one of the main and newer characteristics for Nashi. Three russet varieties and one yellow were judged very attractive : 'Chojuro' - 'Kosui' - 'Shinko' and 'Shinseiki'.

Six russet and two yellow varieties were judged attractive : 'Choju' - 'Hosui' - 'Kumoi' - 'Niitaka' - 'Shinsui' - 'Suisei' - 'Hakko' and 'Nijisseiki'. It is also possible to put in this class 'Xue Hua Li' which is of yellow-green colour with russetting.

Other varieties were less attractive for different reasons : shape of the fruit ('Ping Guo Li' and 'Imamura Aki'). Heterogeneity of the coloration (as 'Hayatama' - 'Kikusui' - 'Kimizuka Wase' or 'Tama'). Size of the fruit (as 'Jing Bai Li' or 'Yakumo').

Characteristics of the flesh were very close from one to another. However it was possible to distinguish some of them for a more pronounced flavour : 'Chojuro' - 'Hosui' - 'Kosui', a better texture : 'Hosui' or a fairly good level for different characteristics : 'Choju' - 'Kumoi' - 'Nijisseiki' - 'Shinseiki' - 'Shinko' - 'Tama'.

Cold storage was very short for early varieties mainly for 'Hayatama' which was subject to scald.

'Kimizuka Wase' and 'Shinsui' had a cold storage until mid of December.

'Choju' - 'Hakko' - 'Hosui' - 'Kumoi' - 'Nijisseiki' and 'Tama' can be stored until end of December.

'Kikusui' - 'Kosui' - 'Niitaka' - 'Shinko' and 'Shinseiki' until mid of January.

Chinese varieties more 'Chojuro' and 'Imamura Aki' can be kept until February.

But the great advantage of Asian pears is that they can be picked ripe and eaten immediately. Brilliancy of the skin and quality decreased gradually.

Susceptibility to pests and diseases.

Except red mites no particular susceptibility was noted in this collection.

Some varieties artificially inoculated on shoots by *Erwinia amylovora* were susceptible but no natural infection was observed. Secondary blooming is also very rare.

Virus indexing was undertaken in Angers by J. Lemoine.

* Eleven clones were found virus free : 'Hakko' - 'Hayatama' - 'Jing Bai Li' - 'Kimizuka Wase' - 'Kumoi' - 'Niitaka' - 'Ping Guo Li' - 'Shinseiki' - 'Shinsui' - 'Susei' and 'Xue Hua Li'.

* Four had only Stem grooving : 'Choju' - 'Chojuro' - 'Hosui' and 'Ya Li'.

* Three had Stem grooving more Vein yellows : 'Imamura Aki' - 'Kikusui' - 'Kosui'.

* One had Stem grooving more Rubbery wood : 'Yakumo'.

* Three had three viruses :

- Stem grooving - Vein yellows - Rubbery wood : 'Shinko' and 'Tama'
- Stem grooving - Vein yellows - Necrotic spot : 'Nijisseiki'.

Stem grooving which is not very common on *Pyrus communis* can induce a bad affinity at the graft union. Necrotic spot is unknown on *P. communis* and detected only by HN 39 indicator in greenhouse.

Thermotherapy is undertaken in Bergerac for some varieties.

Other susceptibilities must be noted :

- a general susceptibility to magnesium deficiency
- a susceptibility to leaf burning of 'Kosui' and 'Kimizuka Wase'.
- a general attractivity for birds.

Temperatures during the winters 1985 - 1986 and 1987 were very severe as well in Angers as in Bergerac. However no cold damage was observed.

Conclusion

In conclusion we can note the good adaptation of Asian pears to climatic conditions of Western part of France.

We will have to solve some problems as selection of good rootstocks possibly propagated by a vegetative way. The choose of varieties can put down into a double frame : colour and picking time ; another point for choosing is also the reputé on the international market.

Until now, if precocity is desired 'Hayatama' must be choosen but 'Kimizuka Wase' and 'Choju' seems to have also some interest. A little iess precocious is 'Shinseiki' and it is the first yellow variety with a good cropping.

'Kosui' and 'Hosui' are more and more planted in Japan and New Zealand ; so their place on the future market is sure.

The problem is different with 'Chojuro' and 'Nijisseiki'. These old varieties present some qualities but also some defects : mainly a coarse flesh for the first and susceptibility to Black spot for the second.

If a long storage is desired, 'Shinko' can be choosen in preference to 'Niitaka', 'Okusankichi' or 'Imamura Aki'.

An important point for the management of the orchard is the thinning. In order to obtain big and well shaped fruits this work is necessary and it is consuming time. In the same way picking must be made very carefully mainly for yellow varieties the skin of which is very susceptible to bruising and discoloration. Picking must be foreseen in at least two times.

Finally economical problems will be perhaps more important for this new fruit than technical ones.

Table 1 - List of varieties in observation

CHOJU	<i>Pyrus serotina</i>	R	Ashi X Kimizuka Wase
CHOJURO	"	R	? (1890)
<u>HAKKO</u>	"	Y	Yakumo X Kosui
<u>HAYATAMA</u>	"	R	Kimizuka Wase X Gion
<u>HOSUI</u>	"	R	Kikusui X Yakumo
IMAMURA AKI	"	R	?
<u>KIKUSUI</u>	"	Y	Taihaku X Nijisseiki
KIMIZUKA WASE	"	R	Shinkozo X Doitsu
<u>KOSUI</u>	"	R	Kikusui X Wasekoso
<u>KUMOI</u>	"	R	Ischiwase X Yakumo
NIITAKA	"	R	Amanogawa X Imamura Aki
NIJISSEIKI	"	Y	? (1888)
OKUSANKICHI	"	R	? (1860)
SHINKO	"	R	? (1932)
<u>SHINSEIKI</u>	"	Y	Nijisseiki X Chojuro
<u>SHINSUI</u>	"	R	Kikusui X Kimizuka Wase
<u>SUISEI</u>	"	Y	Kikusui X Yakumo
<u>TAMA</u>	"	R	Gion X Kosui
<u>YAKUMO</u>	"	Y	Akappo X Nijisseiki
JING BAI LI	<i>Pyrus ussuriensis</i>		
PING GUO LI	<i>Pyrus serotina</i> X <i>P. ussuriensis</i>		
XUE HUA LI	<i>Pyrus bretschneideri</i>		
YA LI	<i>Pyrus bretschneideri</i>		

Underlined varieties have NIJISSEIKI in their pedigree

R = russet Y = yellow

Table 2 - Soil and climatic characteristics

	BERGERAC	ANGERS
<u>SOIL</u>	Brown alluvial soil clayed sand texture	Settled sandy clay - subsoil with hydromorphic conditions and reducing characteristics
Clay	8 %	16 %
Loam	4 %	21 %
very fine sand	20 %	21 %
fine sand	50 %	14 %
coarse sand	18 %	27 %
Total CaCO ₃	0 %	0 %
pH	6.8	5.5
<u>CLIMATE</u>	Atlantic with continental tendency	Atlantic temperate
Average Max. Temp.	18.0°C	15.8°C
Average Min. Temp.	8.0°C	6.8°C
Coldest month (Jan.)	4.7°C	1.5°C
Hottest month (July)	26.0°C	24.4°C
Precipitations	760 mm	591 mm
Number rain days	100	162

Table 3 - Vigor according to girth of the trunk in nursery

class 1 (57 to 60 mm)		class 2 (50 to 56 mm)		class 3 (45 to 49 mm)		class 4 (41 to 45 mm)	
S/s	S/c	S/s	S/c	S/s	S/c	S/s	S/c
HOSUI	CHOJU	HAYATAMA	NIITAKA	CHOJU	HAYATAMA	CHOJU	SHINSUI
KIKUSUI	JING BAI LI	IMAMURA AKI	PING GUO LI	HAKKO	HOSUI	YAKUMO	TAMA
KOSUI		KIMZUKA WASE	SHINKO	JING BAI LI	IMAMURA AKI		
SHINKO	KUMOI	NIJISSEIKI	SUISEI	KUMOI	HAKKO		
		OKUSANKICHI			KIMZUKA WASE		
		SUISEI			KIKUSUI		
		TAMA			XUE HUA LI		
		XUE HUA LI			YAKUMO		
		YA LI					

Vigor according to the height of maiden trees							
class 1 (1.80 to 2.00 m)		class 2 (1.50 to 1.80 m)		class 3 (1.20 to 1.50 m)		class 4 (< 1.20 m)	
S/s	S/c	S/s	S/c	S/s	S/c	S/s	S/c
HOSUI	CHOJU	CHOJU	HAYATAMA	IMAMURA AKI	IMAMURA AKI	CHOJU	CHOJU
YA LI	NIITAKA	HAYATAMA	HOSUI	HAKKO	HAKKO	NIJISSEIKI	KIKUSUI
		KIMZUKA WASE	JING BAI LI	JING BAI LI	KIMZUKA WASE		SHINSUI
		KOSUI	KOSUI	KIKUSUI	PING GUO LI		
		KUMOI	KUMOI	PING GUO LI	SHINKO		
		OKUSANKICHI		SHINKO	SHINSEIKI		
		TAMA		SUISEI	SUISEI		
		XUE HUA LI		YAKUMO	TAMA		
					YAKUMO		

Table 4 - Flowering order in 1988

Angers		Bergerac	
JING BAI LI	} 21/03	JING BAI LI	} 14/03
YA LI		YA LI	
HOSUI	26/03	PING GUO LI	22/03
PING GUO LI	} 28/03	XUE HUA LI	24/03
XUE HUA LI		HOSUI	} 28/03
HAYATAMA	} 02/04	IMAMURA AKI	
NIITAKA		NIITAKA	} 30/03
NIJISSEIKI		SHINSUI	
SHINKO		CHOJURO	
SHINSEIKI		KIKUSUI	
SHINSUI		KOSUI	} 02/04
SUISEI		SHINKO	
CHOJU		SHINSEIKI	
CHOJURO	} 08/04	SUISEI	
HAKKO		HAKKO	} 02/04
IMAMURA AKI	} 10/04	HAYATAMA	
KIKUSUI		TAMA	
KIMIZUKA WASE		YAKUMO	
YAKUMO		<u>WILLIAMS</u>	
<u>PASSE CRASSANE</u>	} 12/04	CHOJU	} 04/04
KOSUI		KIMIZUKA WASE	
KUMOI		OKUSANKICHI	08/04
TAMA		KUMOI	09/04
<u>WILLIAMS</u>	} 12/04		
OKUSANKICHI			

Table 5 - Progression of the production (kg/tree) in Angers

1 - on *P. serotina*

Age	Year	CHOJURO	HOSUI	KOSUI	NIJISSEIKI	Total
2 d	1985	3.2	2.2	1.8	2.8	10.0
3 rd	1986	5.4	2.7	5.8	8.0	21.9
4 th	1987	15.5	11.4	15.6	16.7	59.2
		24.1	16.3	23.2	27.5	91.1

2 - on *P. calleryana*

Age	Year	CHOJURO	HOSUI	KOSUI	NIJISSEIKI	Total
2 d	1985	4.6	3.4	2.9	4.1	15.0
3 rd	1986	16.2	3.5	8.9	7.3	35.9
4 th	1987	24.4	14.9	22.0	23.8	85.1
		45.2	21.8	33.8	35.2	136.0

Table 6 - Production: amount until 1987 (included) kg/tree in Angers

1 - on *P. serotina*

> 40 kg	30 - 40 kg	20 - 30 kg	15 - 20 kg	10 - 15 kg	< 10 kg
	IMAMURA AKI PING GUO LI YA LI	CHOJURO KOSUI NIJISSEIKI XUE HUA LI	CHOJU HOSUI JING BAI LI KUMOI SHINKO TAMA	HAYATAMA KIKUSUI SUISEI	HAKKO KIMIZUKA WASE YAKUMO

2 - on *P. calleryana*

> 40 kg	30 - 40 kg	20 - 30 kg	15 - 20 kg	10 - 15 kg	< 10 kg
CHOJURO IMAMURA AKI	KOSUI KUMOI NIITAKA NIJISSEIKI SHINKO	HOSUI SHINSEIKI TAMA XUE HUA LI	CHOJU HAYATAMA JING BAI LI SHINSUI	KIKUSUI PING GUO LI SUISEI	HAKKO KIMIZUKA WASE YAKUMO

Table 7 - Picking time (ranked in each column)

before BARTLETT (Williams)	time of BARTLETT (Williams)	between BARTLETT COMICE	time of COMICE	after COMICE
HAYATANA CHOJU KIMIZUKA WASE TAMA HAKKO SHINSUI SHINSEIKI YAKUMO	KOSUI SUISEI	KUMOI HOSUI KIKUSUI NIJISSEIKI CHOJURO	NIITAKA	XUE HUA LI JING BAI LI YA LI PING GUO LI SHINKO IMAMURA AKI OKUSANKICHI

In Angers 'Bartlett' is generally picked about August 20 th and
'Comice' about September 20 th

Table 8 - Evolution of flower buds (F.B.) all along the 87/88 season in Angers

		1	2	3	4	5	6	7	8	9	10
		Number of F.B. after pruning Spring 87	Number of clusters after thinning	% of F.B. removed	Number of fruits removed	Number of fruits Harvest 87	Mean weight per fruit	Number of F.B. before pruning Winter 87/88	Number of F.B. after pruning Spring 88	% of F.B. Remaining after pruning	% on annual wood
CHOJURO	S	173	79	54	130	137	115	694	160	23	69
	C	261	114	56	256	120	195	615	141	23	30
NIJISSEIKI	S	212	102	52	386	132	126	170	155	91	14
	C	275	143	48	405	170	140	189	136	72	7
HOSUI	S	203	72	64	138	74	154	171	48	28	66
	C	267	100	62	231	94	158	325	90	27	50
KOSUI	S	172	80	53	170	100	156	305	114	33	67
	C	130	116	11	249	142	155	186	73	39	44
CHOJU	S	125	75	40	200	73	123	287	148	52	22
	C	92	63	32	170	70	141	201	121	60	14

s = P. serotina

c = P. calleriana