

Fruit growing research, vol. XXVIII, 2012

COMPORTAREA UNOR SOIURI DE NUC, ALUN ȘI CASTAN COMESTIBIL ÎN CONDIȚIILE ECOLOGICE DIN SUDUL ROMÂNIEI

BEHAVIOUR OF SOME WALNUT, HAZELNUT AND SWEET CHESTNUT CULTIVARS UNDER THE ENVIRONMENTAL CONDITIONS FROM SOUTH OF ROMANIA

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Abstract

The nut crops are important for their valuable fruits and for their potential to increase the economic growth of Romania. The Southern part of Romania which includes the regions of Oltenia and Muntenia is known for its favourable conditions for fruit growing and in particular for nut crops like walnut, hazelnut and sweet chestnut. During the last two decades at University of Craiova - SCDP Vâlcea several cultivars trials were set up in order to compare the Romanian and foreign cultivars and to establish the most favourable ones for culture in this part of the country. This study presents the behaviour of 19 walnut cultivars (9 Romanian ones and 10 of foreign origin), 19 hazelnut cultivars (8 Romanian and 11 foreign ones) and 11 cultivars and hybrids of sweet chestnut (3 Romanian and 8 of foreign origin). Due to the results obtained several cultivars of walnut, hazelnut and sweet chestnut are recommended to be propagated and planted into the orchards from southern part of Romania.

Keywords: assortment, *Jugans regia*, *Corylus avellana*, *Castanea sativa*

Cuvinte cheie: sortiment, *Jugans regia*, *Corylus avellana*, *Castanea sativa*

1. Introduction

The culture of nut crops (walnut, hazelnut and chestnut) is a necessity and also an opportunity for the economic growth in Romania and assures valuable fruits as quality food sources.

The fruits of these plants are highly demanded and priced on the international markets. The actual nut crops production does not cover the global demands and therefore there are prospects for modernization and expansion of orchards (Botu, 1987; Botu et al. 2001; Cociu et al. 2007; Germain et al. 1999; Slate., 1981; Thompson et al. 1996; Vicol, 2010).

Walnut culture tradition is very old in Romania comparative to those of hazelnut and sweet chestnut ones (Botu, 1987; Botu et al. 1999, 2001, 2009; Cociu et al. 1983, 2007), but their expansion into culture was more sporadic as scattered trees as natural hybrids mostly planted on their roots. Only in the recent years grafted trees and bred cultivars started to be planted into organized orchards.

In order to regain their real importance as fruit tree crops in the development strategy of Romanian fruit growing patrimony is necessary to promote valuable and competitive cultivars that can fulfil the international markets' standards and through clonal propagation to provide planting material for modern intensive orchards.

During the last two decades many domestic and foreign varieties of walnut, hazelnut and sweet chestnut have been introduced for testing at the University of Craiova - RSFG Vâlcea in order to promote the most valuable ones for establishing new orchards into the Southern part of Romania.

The Southern part of Romania which includes the regions of Oltenia and Muntenia is known for its favourable conditions for fruit growing and in particular for nut crops like walnut, hazelnut and sweet chestnut.

2. Material and methods

Between 1995-1998 over 30 walnut cultivars, 24 hazelnut ones and 14 cultivars of sweet chestnut have been introduced at University of Craiova - RSFG Vâlcea. These cultivars have been planted into trials along with domestic cultivars.

Walnut and sweet chestnut cultivars were grafted on local seedling rootstocks of *Juglans regia* and *Castanea sativa* respectively. Hazelnut cultivars were propagated through layering. The planting distances used were 9 by 8 m for walnut and sweet chestnut and 5 by 3 m for hazelnut.

The trials were set up on an alluvial soil of medium fertility. The soil pH varies from 5.5 till 6.5 depending on location, on higher acid soil the sweet chestnut trial was planted.

The trials were set up as randomised block design with 5 replicates and 2 trees per plot.

On each tree observations were carried out every year, data was recorded concerning plant growth, phenological phases, fruit yields, fruit characteristics and behaviour to major diseases and pests.

3. Results and discussions

The research work carried out on nut crops showed good behaviour of 68 cultivars in the trials located in the South of Romania at RSFG Vâlcea: 19 walnut cultivars (9 Romanian ones and 10 of foreign origin), 19 hazelnut cultivars (8 Romanian and 11 foreign ones) and 11 cultivars and hybrids of sweet chestnut (3 Romanian and 8 of foreign origin).

Results presented in this paper refer to 12 to 15 years old trees, data being collected during 2008-2011 period. These 3 years were characterized by 1.7°C higher average temperatures than normal average, the absolute minimal temperature during study was -18.4°C and average rainfall proved lower with 31 to 200 mm comparatively with the multi-annual average of 712 mm.

The Romanian and foreign walnut cultivars behaved differently into the environmental conditions from Oltenia region where RSFG Vâlcea is located. Romanian walnut cultivars exhibit high tree vigour, with the exception of 'Velnița' and 'Valrex', which are medium vigorous (Table 1). Coming into bearing is early ('Valcor', 'Valrex', 'Jupânești', etc) up to late (for 'Sibișel 44' and 'Argeșan'). Most of the Romanian walnut cultivars are protogynous, only 'Valcor' and 'Valrex' are protandrous. Into the South of Romania, the walnut bacterial blight or bacteriosis (*Xanthomonas campestris* pv. *juglandis*) is present, the domestic cultivars proved to be medium susceptible to this disease.

Comparatively with the domestic ones, the foreign walnut cultivars have different behaviour into the trials (Table 2). The growth vigour is medium for most cultivars, only 'Franquette' and 'Serr' present vigorous trees. Coming into bearing is early ('Ferjean', 'Hartley') up to late ('Franquette' and 'Pedro'). All the foreign cultivars in this study were protandrous. Most cultivars are susceptible to bacterial blight, 'Fernor' showed more resistant than others.

The fruit yield recorded into the last 3 years varied in case of Romanian walnut cultivars from 1498 kg/ha ('Argeșan') and 2308 kg/ha ('Valcor'). After taking out the fruits affected by bacterial blight, the marketable yield oscillated from 1362 kg/ha ('Argeșan') to 2098 kg/ha ('Valcor') (Table 3). The highest marketable yields were recorded in case of 'Valcor' (very significant positive) and 'Velnița' (distinct significant), comparative with 'Jupânești' (1626 kg/ha) as control.

In case of foreign walnut cultivars the fruit yield varied from 1682kg/ha ('Franquette') to 2706kg/ha ('Ferjean') (Table 4). Because fruits were attacked by bacterial blight the marketable yields oscillated from 1529 kg/ha ('Franquette') to 2460 kg/ha ('Ferjean'). The damaged fruits by blight represented 9 to 15 % out of total, lower levels were observed for Romanian cultivars (4 to 9%).

The average marketable fruit yield was higher with 300 – 730 kg/ha in case of lateral bearing foreign walnut cultivars ('Ferjean', 'Hartley' and 'Vina') then in the case of highest productive Romanian cultivars ('Valcor' and 'Velnița') for the rest of cultivars the yields were comparable.

Fruit quality of both walnut cultivars' groups proved good (Tables 5 and 6) and fulfilling the demands of the international trade parameters.

For the Oltenia region the following terminal bearing cultivars can be promoted for establishing new orchards: 'Valcor', 'Velnița', 'Jupânești', 'Valmit' and 'Germisara' and as complementary cultivars up to 5-10% the lateral bearing ones: 'Ferjean', 'Vina' and 'Hartley'. The extension into culture in Romania of the lateral bearing walnut cultivars is limited to some areas due to the incidence of low temperatures during winter (-27 to -31°C), bacterial blight attack, lack of irrigation in most cases and high technological demands of the walnut intensive orchards.

The hazelnut is a relatively new nut crop for Romania, nowadays there is a continuous expansion in several regions of Romania like Oltenia, Banat, and South of Transylvania, etc.

The fruit yields of 19 cultivars recorded into the hazelnut trial in RSFG Vâlcea varied from 1.50 t/ha ('Tonda Romana' and 'Daviana') to 2.73 t/ha ('Vâlcea 22') (Table 7). Most productive cultivars proved to be: 'Vâlcea 22' (2.73 t/ha), 'Romavel' (2.50 t/ha), 'Ennis' (2.60 t/ha), 'Urișe de Vâlcea' (2.43 t/ha), etc.

The hazelnut cultivars for table or fresh consumption are characterized by fruits which their size index (S.I.) overpass 20 mm and fruit mass or weight 3.0 g. The size index is equal with $(D+d+h)/3$ and represents the average of all the 3 fruit dimensions expressed in millimetres. The hazelnut cultivars for industry have fruits with size index of 16 to 19 mm, average fruit weight of 2.0-3.0 g and roundness index (R.I.) of 0.90 – 0.96. The roundness index is equal with $(D+d)/2h$.

The Romanian hazelnut table cultivars ('Vâlcea 22', 'Urișe de Vâlcea' and 'Cozia') have the same productive and quality levels like the foreign ones ('Ennis', 'Butler', 'Du Chilly', etc), from the world cultivar assortment (Table 8). The domestic cultivars for industry use ('Romavel', 'Natval', 'Primval') are comparable from qualitative perspective with the world standard cultivar 'T.G.D.L.', but their yields are superior to that of the standard cultivar into the given conditions.

The hazelnut cultivar assortment for the South of Romania can be composed by table cultivars like: 'Vâlcea 22', 'Ennis', 'Halle's Giant', 'Cozia' and 'Uriășe de Vâlcea' and industry ones as: 'T.G.D.L.', 'Romavel', 'Natval' and 'Primval'.

The sweet chestnut is present as sub-spontaneous trees in several locations from subCarpathian area of Oltenia (Tismana, Horezu, Bistrița, Dăești, Polovragi, etc.), but also in culture into several small orchards. Because RSFG Vâlcea is located into a favourable area for sweet chestnut growing the research activity comprised testing of 11 cultivars and local selections (Table 9).

The study emphasized that sweet chestnut have a productive capacity of 4.83 t/ha ('Marron Comballe C.A 106') to 7.36 t/ha ('Marrissard C.A. 122'). The Romanian cultivars 'Romval' and 'Casval' recorded quite good yields (5.86 to 6.07 t/ha).

Most of the chestnut cultivars studied are protandrous (including the Romanian cultivars and selections), but there are cultivars without pollen (astaminate or brachystaminate) like: 'Marissard C.A.122', 'Marigoule C.A. 15' and 'Marron Comballe C.A. 106'.

The studied cultivars produced large fruits with size index from 28.0 to 33.3 mm and fruit weight of 12.2 to 19.8 g in average. The average kernel weigh varied from 10.2 to 17.4g and the kernel efficiency from 82.5 to 88.3 %. (Table 10).

Six sweet chestnut cultivars produced mono-embryonic fruits and 5 poly-embryonic ones. The colour and fruit shape are different from one cultivar to another. Most cultivars have creme kernel colour, the exceptions with white kernel being 'Marigoule C.A.15' and 'Bouche Rouge C.A 102'.

The sweet chestnut cultivar assortment for the subCarpathian area of Oltenia can be composed from the following ones: 'Marissard C.A 122', 'Marsol C.A 07', 'Maraval C.A. 74' and 'Romval'.

4. Conclusions

The Southern part of Romania (subCarpathian area and plane area from Oltenia and Muntenia) is favourable for walnut, hazelnut and sweet chestnut growing when the humidity in the soil is assured and with the condition of avoiding the micro zones where the absolute minimum temperatures drop to -27 or -28°C.

In order to assure the competitively on the market it is necessary to use a cultivar assortment composed by valuable domestic and introduced nut crop cultivars.

The following walnut cultivars are recommended for propagation and planting into orchards located into the South of Romania: 'Valcor', 'Velnița', 'Jupânești', 'Valmit' and 'Germisara' and complementary 'Ferjean', 'Vina' and 'Hartley'.

In case of the hazelnut cultivar assortment we recommend the following table cultivars: 'Vâlcea 22', 'Ennis', 'Halle's Giant', 'Cozia' and 'Uriășe de Vâlcea' and cultivars for industry: 'TGDL', 'Romavel', 'Natval' and 'Primval'.

For the sweet chestnut assortment we recommend the following: 'Marissard C.A. 122', 'Marsol C.A. 07', 'Maraval C.A. 74' and 'Romval'. These cultivars will complete the assortments which exist in some micro zones where other Romanian or foreign cultivars exist.

Acknowledgements

This work was also co-financed from the European Social Fund through Sectorial Operational Programme Human Resources Development 2007-2013, project no. POSDRU/I.89/1.5/S62371 - Postdoctoral School in Agriculture and Veterinary Medicine Area.

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Tables

Table 1. The main characteristics of Romanian walnut cultivars grown in Vâlcea area

No.	Cultivar	Tree vigour	Coming into bearing	Susceptibility to bacteriosis	Type of blooming (Dichogamy)	Bearing fruits type	Catkin abundance
1	'Sibişel 44'	high	late	intermediate	protogynous	terminal	intermediate
2	'Valcor'	high	early	intermediate	protandrous	terminal	heavy
3	'Valmit'	high	intermediate	intermediate	protogynous	terminal	intermediate
4	'Valrex'	intermediate	early	intermediate	protandrous	terminal	intermediate
5	'Jupâneşti' (Control)	high	early	intermediate	protogynous	terminal	heavy
6	'Argeşan'	high	late	intermediate	protogynous	terminal	intermediate
7	'Geoagiu 65'	high	early	intermediate	protogynous	terminal	heavy
8	'Germisara'	high	early	intermediate	protogynous	mixt	heavy
9	'Velniţa'	intermediate	early	intermediate	protogynous	terminal	intermediate

Table 2. The main fruiting characteristics of foreign walnut cultivars grown in Vâlcea area

No.	Cultivar	Tree vigour	Coming into bearing	Susceptibility to bacteriosis	Blooming type (Dichogamy)	Bearing fruits type	Catkin abundance
1	'Franquette'(Control)	high	late	intermediate	protandrous	terminal	intermediate
2	'Ferjean'	intermediate	early	low	protandrous	lateral	intermediate
3	'Fernette'	intermediate	intermediate	low	protandrous	lateral	intermediate
4	'Fernor'	intermediate	intermediate	intermediate	protandrous	lateral	intermediate
5	'Hartley'	intermediate	early	low	protandrous	mixed	heavy
6	'Lara'	intermediate	intermediate	low	protandrous	lateral	intermediate
7	'Payne'	intermediate	intermediate	low	protandrous	lateral	intermediate
8	'Serr'	high	intermediate	low	protandrous	lateral	heavy
9	'Pedro'	intermediate	late	low	protandrous	lateral	intermediate
10	'Vina'	intermediate	intermediate	intermediate	protandrous	lateral	intermediate

Table 3. Fruit yield of several Romanian walnut cultivars (12th to 15th leaf)

No.	Cultivar	Yield (kg/tree)				Average marketable yield (kg/tree)	Average marketable yield (139 trees/ha)	Difference compared with Control (±)	Significance	Total yield (incl. fruits affected by bacteriosis) (Kg/ha)
		2008	2009	2010	2011					
1	'Sibişel 44'	9.7	10.6	10.0	12.6	10.7	1487	-139	ooo	1636
2	'Valcor'	12.8	15.8	15.5	16.2	15.1	2098	+472	***	2308
3	'Valmit'	9.7	10.0	10.5	13.6	11.0	1529	-97	oo	1682
4	'Valrex'	8.4	9.6	10.2	12.7	10.2	1418	-140	ooo	1560
5	'Jupâneşti' (Control)	9.8	10.4	12.9	13.8	11.7	1626	-	-	1789
6	'Argeşan'	8.1	9.6	9.2	12.2	9.8	1362	-264	ooo	1498
7	'Geoagiu 65'	8.7	8.9	10.4	11.9	10.0	1390	-236	ooo	1529
8	'Germisara'	9.9	12.7	10.9	12.7	11.6	1612	-14	n.s	1773
9	'Velniţa'	12.2	10.5	12.3	15.1	12.5	1737	+111	**	1911

LSD 5.0% = 65.3; LSD 1.0% = 86.4; LSD 0.1% = 111.2

Table 4. Fruit yield of several foreign walnut cultivars tested in Vâlcea area (12th – 15th leaf)

No.	Cultivar	Yield (kg/tree)				Average marketable yield (kg/tree)	Average marketable yield (139 trees/ha)	Difference compared with Control (±)	Significance	Total yield (incl. fruits affected by bacteriosis) (Kg/ha)
		2008	2009	2010	2011					
1	'Franquette' (Control)	9.7	8.6	12.6	12.9	11.0	1529	-		1682
2	'Ferjean'	13.2	14.9	22.3	20.6	17.7	2460	+931	***	2706
3	'Fernette'	10.5	10.8	15.3	16.1	12.4	1724	+195	***	1965
4	'Fernor'	12.2	11.1	14.3	17.4	13.8	1918	+389	***	2148
5	'Hartley'	10.1	15.7	17.5	21.7	16.3	2266	+737	***	2605
6	'Lara'	12.4	10.4	12.1	17.9	13.2	1835	+306	***	2128
7	'Payne'	8.6	10.4	12.3	17.4	12.2	1696	+167	***	1865
8	'Serr'	8.9	10.0	10.4	16.7	11.5	1599	+70	n.s.	1855
9	'Pedro'	8.7	10.0	11.3	16.4	11.6	1612	+83	n.s.	1805
10	'Vina'	16.1	14.1	17.5	22.7	17.6	2446	+917	***	2690

LSD 5.0% = 98.8; LSD 1.0% = 131.5; LSD 0.1% = 154.6

Table 5. Fruit characteristics of the Romanian walnut cultivars tested

No.	Cultivar	Fruit shape	Average fruit weight (g)	Average kernel percent (%)	Shell seal	Ease of kernel removal	Kernel taste	Kernel colour
1	'Sibişel 44'	triangular	16.2	52	medium	easy	good	light
2	'Valcor'	broad ovate	14.3	52	weak	easy	good	light
3	'Valmit'	round	12.1	53	weak	easy	good	light
4	'Valrex'	ovate	15.3	51	weak	easy	good	light
5	'Jupâneşti' (Control)	elliptic	12.2	49	weak	easy	good	light amber
6	'Argeşan'	ovate	15.3	48	medium	medium	good	light amber
7	'Geoagiu 65'	elliptic	14.8	49	medium	easy	good	light amber
8	'Germisara'	broad ovate	16.8	48	weak	easy	good	light amber
9	'Velniţa'	round	12.7	52	medium	medium	good	light amber

Table 6. Fruit characteristics of the foreign walnut cultivars tested

No.	Cultivar	Fruit shape	Average fruit weight (g)	Average kernel percent (%)	Shell seal	Ease of kernel removal	Kernel taste	Kernel colour
1	'Franquette' (Control)	broad elliptic	12.4	47	strong	easy	good	light amber
2	'Ferjean'	round	11.0	53	strong	easy	good	light
3	'Fernette'	trapezoid	13.2	48	strong	easy	good	light
4	'Fernor'	long trapezoid	12.9	49	strong	medium	good	light amber
5	'Hartley'	triangular	11.7	49	medium	easy	good	light amber
6	'Lara'	round	15.4	47	medium	easy	good	light
7	'Payne'	ovate	12.4	49	medium	easy	good	light
8	'Serr'	ovate	12.9	53	medium	medium	good	light
9	'Vina'	ovate	12.3	49	weak	easy	good	light amber
10	'Pedro'	broad elliptic	13.9	47	weak	easy	good	light

Table 7. The yield of hazelnut cultivars in the subCarpathian area of Oltenia during 2009-2011 period (t/ha)

No.	Cultivar	Year			Mean (2009-2011)	Difference (±)	Signification
		2009	2010	2011			
1	'Red Lambert'	2.1	1.9	2.4	2.13	-0.60	-
2	'Roverd'	1.9	2.7	1.7	2.1	-0.63	-
3	'Vâlcea 22' (Control)	2.8	1.8	3.6	2.73		
4	'Daviana'	1.6	0.8	2.1	1.5	-1.20	oo
5	'Grossal'	1.8	1.5	1.6	1.63	-1.10	o
6	'Romavel'	2.8	1.9	2.8	2.5	-0.23	-
7	'Tonda Romana'	2.6	0.3	1.7	1.53	-1.20	oo
8	'Empress Eugenia'	2.5	0.4	2.4	1.76	-0.97	-
9	'Cozia'	2.5	1.8	1.9	2.06	-0.67	-
10	'Segorbe'	2.3	1	2.2	1.83	-0.90	o
11	'Halle's Giant'	2.8	0.8	2.2	1.93	-0.80	-
12	'TGDL'	2	0.8	2.9	1.9	-0.83	-
13	'Ennis'	3	1.9	2.9	2.6	-0.13	-
14	'Gunsleben'	2.3	0.8	2.2	1.76	0.97	o
15	'Butler'	2.2	2.6	1.9	2.23	-0.50	-
16	'Du Chilly'	2.7	2.3	2.7	2.56	-0.17	-
17	'Urișe de Vâlcea'	3.8	0.6	2.9	2.43	-0.30	-
18	'Natval'	2.6	2.2	2	2.26	-0.47	-
19	'Primval'	2.2	2.1	2.2	2.16	-0.57	-

LSD 5% = 0.88; LSD 1% = 1.18; LSD 0.1% = 1.55

Table 8. Main fruit characteristics of several hazelnut cultivars in the subCarpathian area of Oltenia

No.	Cultivar	Fruit size index (mm)	Fruit weight (g)	Fruit shape	Exocarp thickness (mm)	Roundness index (lr)	Fruit use
1	'Red Lambert'	15.1	1.8	long subcylindrical	1.1	0.63	table
2	'Roverd'	15.6	1.6	long subcylindrical	1.2	0.75	industry
3	'Vâlcea 22'	21.9	3.8	oblate	1.2	1.11	table
4	'Daviana'	18.9	3.2	globular	1.2	0.91	table
5	'Romavel'	16.9	2.6	globular	1.0	0.96	industry
6	'Tonda Romana'	16.6	2.7	globular	1.1	0.95	industry
7	'Empress Eugenia'	12.4	1.8	ovoid	1.2	0.89	industry
8	'Cosford'	16.0	2.3	long subcylindrical	1.0	0.65	table
9	'Cozia'	20.0	3.8	globular	1.3	0.90	table
10	'Segorbe'	17.2	2.3	globular	1.3	0.91	industry
11	'TGDL'	17.6	2.5	globular	1.1	0.96	industry
12	'Ennis'	22.6	4.0	globular	1.2	0.84	table
13	'Halle's Giant'	21.5	3.8	conical	1.4	0.99	table
14	'Butler'	20.2	4.0	subcylindrical	1.0	0.80	table
15	'Du Chilly'	18.8	2.9	long subcylindrical	1.2	0.62	table
16	'Valverd'	16.7	1.9	long subcylindrical	1.2	0.85	industry
17	'Primval'	17.8	2.4	globular	1.2	0.94	industry
18	'Natval'	18.7	2.8	globular	1.2	0.95	industry
19	'Urișe de Vâlcea'	22.8	3.8	short subcylindrical	1.3	0.85	table

Table 9. Production capacity of several sweet chestnut cultivars tested into the subCarpathian area of Oltenia

No.	Cultivar	Dichogamy type	Fruit yield (t/ha)					Significance
			2009	2010	2011	Average yield (2009-2011)	Difference (\pm)	
1	'Marissard C.A.122'	no pollen*	6.31	8.12	7.67	7.36	+1.29	***
2	'Marsol C.A. 07'	protandrous homogamous	5.90	7.85	7.45	7.06	+0.99	***
3	'Marigoule C.A.15'	no pollen*	5.51	7.20	7.11	6.60	+0.53	*
4	'Bouche Rouge C.A.102'	protandrous	4.79	7.40	7.68	6.62	+0.55	*
5	'Bournette C.A.112'	protandrous	3.85	6.85	6.74	5.81	-0.26	n.s.
6	'Maraval C.A.74'	protandrous	3.20	6.42	7.04	5.55	-0.52	o
7	'Precoce Migoule C.A 48'	protandrous	2.95	5.92	6.92	5.26	-0.81	oo
8	'Marron Comballe C.A.106'	no pollen*	2.47	5.78	6.24	4.83	-1.24	ooo
9	'Romval' (VL 504 Hz) (Control)	protandrous	3.15	7.22	7.86	6.07	-	-
10	'Casval' (VL 530 B)	protandrous	3.32	6.94	7.32	5.86	-0.21	n.s.
11	'VL 503 Hz'	protandrous	3.96	7.31	7.46	6.24	+0.17	n.s

LSD 5.0% = 0.52; LSD 1.0% = 0.70; LSD 0.1% = 0.92

* astaminate or brachystaminate male flowers in the catkins

Table 10. Main fruit characteristics of the sweet chestnut cultivars studied

No.	Cultivar	Fruit size index (mm)	Fruit weight (g)	Kernel weight (g)	Kernel percentage (%)	Fruit shape	Fruit colour	Kernel colour	Fruit embryony	Hilum size
1	'Marissard C.A.122'	33.3	15.4	13.0	84.3	globose	dark brown	creme	mono-embryonic	large
2	'Marsol C.A. 07'	30.5	18.6	15.3	82.6	broad ovoid	dark brown	creme	mono-embryonic	large
3	'Marigoule C.A.15'	33.0	16.0	15.3	82.5	globose	reddish brown	white	mono-embryonic	large
4	'Bouche Rouge C.A.102'	25.2	15.0	13.2	88.1	transverse ellipsoid	dark brown	white	poly-embryonic	medium
5	'Bournette C.A.112'	30.4	15.7	13.4	85.4	transverse ellipsoid	light brown	creme	mono-embryonic	large
6	'Maraval C.A.74'	30.0	19.8	17.4	88.1	globose	light brown	creme	mono-embryonic	medium
7	'Precoce Migoule C.A 48'	29.4	14.6	12.1	82.8	transverse ellipsoid	brown	creme	mono-embryonic	large
8	'Marron Comballe C.A.106'	30.1	15.4	13.2	86.1	transverse ellipsoid	dark brown	creme	poly-embryonic	large
9	'Romval' (VL 504 Hz)	30.1	16.5	13.2	83.6	globose	dark brown	creme	poly-embryonic	medium
10	'Casval' (VL 530 B)	28.0	12.2	10.2	83.6	globose	dark brown	creme	poly-embryonic	medium
11	'VL 503 Hz'	32.3	15.3	13.5	88.3	transverse ellipsoid	dark brown	creme	poly-embryonic	medium