Project title:	Onions - independent assessment of field and storage potential of varieties
Project number:	FV 348c
Project leader:	Bruce Napier, NIAB
Report:	Final Report
Previous report:	Annual report 2013 Annual repot 2014
Key staff:	Bruce Napier Shaun Coleman
Location of project:	NIAB, Cambridge Set trials: Lincolnshire and Suffolk Drilled trials: Essex and Norfolk
Industry Representative:	Tom Will, VCS
Date project commenced:	01 April 2012
Date project completed (or expected completion date):	30 July 2015

DISCLAIMER

The results and conclusions in this report are based on an investigation conducted over a one-year period. The conditions under which the experiments were carried out and the results have been reported in detail and with accuracy. However, because of the biological nature of the work it must be borne in mind that different circumstances and conditions could produce different results. Therefore, care must be taken with interpretation of the results, especially if they are used as the basis for commercial product recommendations.

AUTHENTICATION

We declare that this work was done under our supervision according to the procedures described herein and that the report represents a true and accurate record of the results obtained.

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GROWER SUMMARY

Headline

- New varieties add positively to the choices available to growers offering excellent storage potential; a broader range of red varieties; and downy mildew resistance.

Background

The aim of the work is to provide independent assessment of the yield, quality and storage potential of new onion varieties propagated from seed. There are direct comparisons of new and established varieties and growers have the opportunity to inspect the trials at key stages. Plant breeders continue to develop improved varieties with characteristics that meet grower requirements e.g. high yield, disease resistance, good quality and storability.

Set onions account for approximately 30% of the area grown in the UK. Early maturing varieties such as Jagro are favoured to give an early harvest while the Sturon types mature later but can be stored until Christmas. Red Baron still commands a large percentage of the red area.

Drilled onions account for approximately 70% of the area grown in the UK. Early maturing varieties such as Hybing, Centro and Vision are popular. Hybound is a promising new early variety that has gained popularity. Maincrop and late maturing varieties still hold a large proportion of the acreage e.g. varieties such as Hytech and Armstrong are still important in extending the harvest window. Red Baron still commands a large percentage of the red area with Redspark also being popular.

Overwintered onions are still grown on a small scale but there are not enough varieties to warrant evaluation trials.

Results – Set Onions

Trial records and data collected – onion trials planted from sets

Table A shows key areas of interest – maturity, marketable yield and storage data.
A full set of data tables is appended to the full report.

Trial site details

Sites were agreed with AHDB Horticulture/BOPA through a steering group, storage was at NIAB in an ambient store.

The trials were hosted by (with thanks) and located as follows:

- A W Mortier Farms, nr Leiston, Suffolk - set onions
- R Oldershaw Farms, nr Weston, Lincolnshire - set onions

The trials were planted between 25th Feb. and 3rd April (Suffolk) and 11th March and 4th April (Lincs).

The trials were harvested on 17th and 31st July (Suffolk) and 22nd and 29th July (Lincs). Many counties encountered mean temperatures above the long term averages for the months March to July which resulted in crops being early.

Time of planting is crucial for the earlier maturing varieties. Land preparation and set availability hampered the timings in 2014.

Mildew was not a problem in the trials – it came in late at low levels of infection when the crops were maturing.

Table A. NIAB Spring Sown Onion Trials from sets 2014 – Varieties, Maturities, Yield & Storage

Varieties in maturity order (mean of both sites); Main 3 replicates; *Preliminary 2 replicates of data*

			Maturity	marketable yield	Ambient Storage
Variety	set source	Seed source	Date of 80% foliage fallover	(t/ha)	% sound bulbs at end April
Early Browns			Suffolk	Mean	Mean
Forum	Broer/Elsoms	Bejo/De Groot en Slot	27-Jun	58.8	-
Spitfire	*Allium Seeds UK Ltd*	*Allium Seeds UK Ltd*	*02-Jul*	*54.2*	-
Troy	Broer/Elsoms	Bejo/De Groot en Slot	02-Jul	46.3	-
Alpha	Allium Seeds UK Ltd	Allium Seeds UK Ltd	06-Jul	64.2	-
Jagro	English Set Company	Bejo/De Groot en Slot	16-Jul	95.8	-
Griffon	*Allium Seeds UK Ltd*	*Allium Seeds UK Ltd*	*21-Jul*	*81.9*	-
				66.9	
Early Reds					

Red Arrow	*Allium Seeds UK Ltd*	*Allium Seeds UK Ltd*	*12-Jul*	*61.1*	
Maincrop Browns			Mean		
Rumba	Allium Seeds UK Ltd	Allium Seeds UK Ltd	20-Jul	66.2	35
VCS 6004	English Set Company	Confidential	21-Jul	65.6	37
VCS 6005	English Set Company	Confidential	21-Jul	68.9	27
Sturon	English Set Company	Confidential	23-Jul	67.1	46
Setton	Allium Seeds UK Ltd	Allium Seeds UK Ltd	24-Jul	67.9	50
Stur BC20	Broer/Elsoms	Bejo/De Groot en Slot	25-Jul	61.2	19
				66.1	**36**
Maincrop Reds					
Red Baron (ELS)	Broer/Elsoms	Bejo/De Groot en Slot	20-Jul	47.8	29
Red Light F1	Broer/Elsoms	Bejo/De Groot en Slot	22-Jul	65.3	5
Red Ray F1	Broer/Elsoms	Bejo/De Groot en Slot	26-Jul	56.2	28
Garnet	Allium Seeds UK Ltd	Allium Seeds UK Ltd	26-Jul	57.1	25
				56.6	**22**

The following varieties are of most interest to the industry. Full information on all varieties can be found in the 'Full Trial Report'.

Sets still attract a premium as they are earlier to market than drilled crops and fill a gap when stores are becoming empty.

For organic growers and for high disease pressure years the mildew resistant varieties offer potential – Santero was not in trial but commercially does well in areas where mildew is a problem.

There is a good range of maturities allowing growers to spread their harvest period.

Establishment was good due to above average temperatures in March. Set availability was a problem and some of the early material was not planted until later which will have reduced the benefit of them potentially maturing early, but they were still up to 3 weeks earlier.

Jagro, Griffon, Troy and Red Arrow all had good early vigour.

Forum, Spitfire, Troy and Red Arrow were the earliest maturing varieties. There was not much spread of maturities in the main crop varieties.

Very little mildew was seen and this only came into crops in July so there was little damage seen.

The mean trial yields were above the 10 year average due to the mild conditions and low disease pressure.

Jagro and Griffon were the highest yielding brown earlies. Red Arrow and Red Light were the highest yielding reds.

Spitfire and Forum had the best neck finishes.
Skin quality was generally poorer than on the main crop varieties but Spitfire, Alpha and Jagro had the best skin finishes of the early material.

Early material tends not to be suitable for storage and are thus not formally recorded. However Alpha was the best of the earlies observed.
Of the brown maincrop varieties Setton and Sturon had the highest percentage of sound bulbs in April. Red Baron and Red Ray were the best of the reds.

There were quite a few rots in the harvested material and through storage. Fusarium base rots were higher than some years due to the warmer than average temperatures from March to July.

Results – Drilled Onions

Trial records and data collected – onion trials drilled from seed

Table B shows key areas of interest – maturity, marketable yield and storage data.
A full set of data tables is appended to the full report.

Trial site details

Sites were agreed with AHDB Horticulture/BOPA through a steering group, storage was at NIAB in an ambient store and at P G Rix in commercial CE store.

The trials were hosted by (with thanks) and located as follows:

- J Raker Farms, Croxton, Norfolk – drilled onions
- P G Rix Farms, nr Colchester, Essex – drilled onions

The trials were harvested on 21st August (Norfolk) and 28th August (Essex). The 2014 season was mild and maturities were earlier than in 2012 and 2013. Many counties encountered mean temperatures above the long term averages for the months March to July which resulted in crops being up to 3 weeks earlier, but a cool August then delayed harvest slightly. This contrasted starkly with 2013 where cool and grey April, May and June meant that crops were slow growing, late maturing and some varieties were taken green.
Mildew was a problem in some areas of the country with the Norfolk trial being affected.

Table B. NIAB Spring Sown Onion Trials drilled from seed 2014 – Varieties, Maturities, Yield & Storage

Varieties in maturity order (mean of both sites); Main 3 replicates; *Preliminary 2 replicates of data*

Variety	Source	Maturity Date of 80% foliage fallover	Yield marketable (t/ha)	Ambient Storage % sound bulbs at end May	CE Storage % sound bulbs at end July
BROWNS					
Hybound (BGS266)	Bejo	04-Aug	71.9	26	34
Hybing	Bejo	04-Aug	76.3	25	21
Vision	Syngenta	07-Aug	71.1	42	57
Hypark	Bejo	07-Aug	71.0	24	28
Medaillon	Syngenta	08-Aug	63.5	31	34
Centro	Hazera	09-Aug	70.7	19	23
Wellington	Syngenta	09-Aug	72.0	36	55
Napoleon	Syngenta	10-Aug	69.9	25	26
Progression (ONL354)	*Syngenta*	*10-Aug*	67.9	44	31
Hysky (BGS289)	Bejo	10-Aug	73.7	36	44
Paradiso	Hazera	10-Aug	67.7	32	37
Motion	Syngenta	11-Aug	71.3	47	52
SV3557ND	Seminis	11-Aug	69.7	33	33
Arthur	Hazera	11-Aug	74.3	13	22
Chico (NIZ 37-89)	Hazera	11-Aug	59.3	33	37

RS07751481	Seminis	12-Aug	74.2	28	28
Mannito	Seminis	15-Aug	69.5	26	21
Hystore (BGS290)	Bejo	16-Aug	73.2	38	31
Santero	Hazera	17-Aug	69.2	16	21
Mean		**10-Aug**	**70.3**	**30**	**33**
REDS					
af 222	*Allium Farms*	*02-Aug*	64.2	26	32
af 1.11	Allium Farms	05-Aug	62.2	26	36
Red Planet	Allium Farms	05-Aug	54.8	36	33
Red Tide	Bejo	06-Aug	65.2	38	50
Red Light	Bejo	06-Aug	69.3	4	29
Redspark	Bejo	10-Aug	64.5	27	43
Red Baron	Bejo	12-Aug	64.8	22	35
af 1.75	Allium Farms	15-Aug	55.8	38	42
Retano	Hazera	17-Aug	62.6	15	51
Mean		**09-Aug**	**62.6**	**26**	**39**

The following varieties are of most interest to the industry. Full information on all varieties can be found in the 'Full Trial Report'.

There is a good range of maturities allowing growers to spread their harvest period. In cooler years, such as 2013, the opportunities to harvest later maturing varieties can run over into October which can result in bulbs being harder to dry and some 'telescoping/tubing' occurring in material insufficiently dried.

For organic growers and for high disease pressure years the mildew resistant varieties offer potential – Santero was the highest yielding variety on the mildew affected Norfolk site. Establishment was good, above average temperature in March through to July meant that growth was good and up to 3 weeks ahead of normal. Wet conditions in the 3rd week of August delayed harvest on some commercial crops.

Hybound and Hybing were the earliest maturing varieties of the drilled trials. However some varieties will mature in a different sequence in seasons with key drivers being soil type, fertility and the use of starter fertilizers as well as different environmental factors such as the cooler 2013 season.

Mildew was at low enough levels to be kept under control by regular fungicide applications in the Essex trial but the disease pressure was high in Norfolk and it was not possible to fully control mildew on the maturing crop.

The mean trial yield in Norfolk was below the 10 year average due to the mildew infections while the yield in the cleaner Essex trial was above average.

In the Essex trial the highest yielding brown varieties were Hybing, Hysky and Arthur. AF222 was the highest yielding red variety.

In the Norfolk trial Santero, RS07751481 and Hybing were the highest yielding browns. Red Tide and Red Baron were the highest yielding red varieties.

There were quite a few rots in the harvested material of the Norfolk drilled trial. These were mainly Fusarium base rots.

Hybound, Hybing, Hypark, Hysky, Progression, Chico, AF1.11 and Red Planet were the best of the varieties for having high percentages of single centres. Hypark, Hysky and Chico all performed well in 2013.

Storage assessments in an ambient store, were recorded in late-April and late-May 2015.

Storage potential continues to be a key factor for drilled crops. As in 2012/13 and 2013/14 Wellington, Vision and Hysky had above average percentages of sound bulbs at the late-May assessment. Progression, Motion and Hystore also performed above average in 2014/15.

Red Planet, Red Tide and AF 1.75 performed well in the reds. Redspark and AF1.11 were average but had performed above average in previous years.

Stored bulb quality was generally very good throughout most of the varieties.

The highest percentage of sound bulbs from the controlled environment store was from Vision, as in previous years, others which performed above the average were Wellington, Hysky, Motion, Paradiso and Chico With the exception of Paradiso these were all above average in the previous season's trial.

Red Tide, Retano and Redspark had the highest percentage of sound bulbs in the reds.

Main Conclusions

Set Trials

There was almost a month difference between the earliest and latest maturing varieties.

The yield potential of varieties can vary greatly. In the set trials this was almost 50 t/ha between the highest and lowest yields (mean of both trials).

Yield out of store is also important. Main set material showed a difference of up to 45%, between the best and worst storage potential from ambient store

Drilled Trials

In the drilled trials there was approx. 17t/ha between the highest and lowest yields (mean of both trials).

Drilled material showed a difference of over 40%, between the best and worst storage potential from ambient store and of approx. 35% from CE store.

Mildew resistant varieties require fewer and or cheaper fungicide programmes.

Action Points

- Select a range of varieties with different maturities to spread the harvest.
- Select varieties best suited to your storage facilities.
- For varieties not suited to long term storage growers must be able to sell their produce quickly.
- In high disease pressure years growers should take advantage of material with disease resistance e.g. mildew resistance.

FULL TRIAL REPORT

Introduction

The aim of the work is to provide independent assessment of the yield, quality and storage potential of new onion varieties, propagated from seed and sets, that meet grower requirements i.e. high marketable yield, disease resistance, good quality and storability. These requirements need to be balanced and compared over a number of years as there can be a great deal of variation between seasons. There are direct comparisons of new and established varieties.

Varieties can perform very differently in the United Kingdom from Holland and other parts of mainland Europe. Breeding companies have central breeding programmes and they trial their varieties in a number of countries to find the ones that are most suitable to the local conditions and growing practices. UK trials are essential to provide information for growers when they select their varieties.

Onions grown from sets ensure an early crop which avoids potentially damaging autumn harvest conditions and the earliest of these can attract a premium. Newer entries have brought new genetics - in particular varieties bringing early maturity or mildew resistance. However there are bolting risks associated with some early material as it may be best suited to intermediate day length rather than long day length. Set trials are conducted in alternate years – the last trials were in 2012.

‘Sturon type’ varieties continue to dominate the brown set main-crop maturity varieties. However there are very early maturing varieties which produce high yields that are suitable for the autumn markets. The mildew resistant variety Santero also has good storage potential, as a set onion, and is valuable addition for organic growers. Red Baron has previously dominated the red set market but there is strong competition from early maturing material such as Red Emperor and high quality hybrids.

Drilled onions account for approximately 70% of the area grown in the UK. Early maturing varieties such as Hybing, Centro and Vision are popular. Hybound is a promising new early variety that has gained popularity. Maincrop and late maturing varieties still hold a large proportion of the acreage e.g. varieties such as Hytech and Armstrong are still important in extending the harvest window. Red Baron still commands a large percentage of the red area with Redspark also being popular.

Overwintered onions are still grown on a small scale but there are not enough varieties to warrant evaluation trials.

Results of the Variety Trials

Trial site details

Sites were agreed with AHDB Horticulture/BOPA through a steering group, storage was at NIAB in an ambient store and at P G Rix in commercial CE store.

The trials were hosted by (with thanks) and located on open aspect, commercial fields as follows:

- J Raker Farms, Croxton, Norfolk – drilled onions on a Breckland soil
- P G Rix Farms, nr Colchester, Essex – drilled onions on a silty soil
- A W Mortier Farms, nr Leiston, Suffolk - set onions on a sandy soil
- R Oldershaw Farms, nr Weston, Lincolnshire – set onions on a silty soil

All trials followed local commercial agronomy. No maleic hydrazide was applied.

Trial records and data collected –set trials

Table C shows key areas of interest - selected yield storage data.
A full set of data tables is appended.

The trials were planted between 25th Feb. and 3rd April (Suffolk) and 11th March and 4th April (Lincs). The trials were harvested on 17th and 31st July (Suffolk) and 22nd and 29th July (Lincs). Many counties encountered mean temperatures above the long term averages for the months March to July which resulted in crops being early where planting had been early too.
Time of planting is crucial of the earlier maturing varieties. Land preparation and set availability hampered the timings in 2014. Mildew was not a problem in the trials – it came in late at low levels of infection when the crops were maturing.

Table C. NIAB Spring Sown Onion Trials from sets 2014 – Varieties, Maturities, Yield & Storage

Varieties in maturity order (mean of both sites); Main 3 replicates; *Preliminary 2 replicates of data*

			Maturity	marketable yield	Ambient Storage
Variety	set source	Seed source	Date of 80% foliage fallover	(t/ha)	% sound bulbs at end April
Early Browns			Suffolk	Mean	Mean
Forum	Broer/Elsoms	Bejo/De Groot en Slot	27-Jun	58.8	-
Spitfire	*Allium Seeds UK Ltd*	*Allium Seeds UK Ltd*	*02-Jul*	*54.2*	-
Troy	Broer/Elsoms	Bejo/De Groot en Slot	02-Jul	46.3	-
Alpha	Allium Seeds UK Ltd	Allium Seeds UK Ltd	06-Jul	64.2	-
Jagro	English Set Company	Bejo/De Groot en Slot	16-Jul	95.8	-
Griffon	*Allium Seeds UK Ltd*	*Allium Seeds UK Ltd*	*21-Jul*	*81.9*	-
				66.9	
Early Reds					
Red Arrow	*Allium Seeds UK Ltd*	*Allium Seeds UK Ltd*	*12-Jul*	*61.1*	
Maincrop Browns			Mean		
Rumba	Allium Seeds UK Ltd	Allium Seeds UK Ltd	20-Jul	66.2	35
VCS 6004	English Set Company	Confidential	21-Jul	65.6	37
VCS 6005	English Set Company	Confidential	21-Jul	68.9	27
Sturon	English Set Company	Confidential	23-Jul	67.1	46
Setton	Allium Seeds UK Ltd	Allium Seeds UK Ltd	24-Jul	67.9	50
Stur BC20	Broer/Elsoms	Bejo/De Groot en Slot	25-Jul	61.2	19
				66.1	**36**
Maincrop Reds					
Red Baron (ELS)	Broer/Elsoms	Bejo/De Groot en Slot	20-Jul	47.8	29
Red Light F1	Broer/Elsoms	Bejo/De Groot en Slot	22-Jul	65.3	5

Red Ray F1	Broer/Elsoms	Bejo/De Groot en Slot	26-Jul	56.2	28
Garnet	Allium Seeds UK Ltd	Allium Seeds UK Ltd	26-Jul	57.1	25
				56.6	**22**

***Discussion* - Set trials**

Sets still attract a premium as they are earlier to market than drilled crops and fill a gap when stores are becoming empty. Over-wintered set crops only play a small part in filling this gap and can be very unpredictable in their yields and quality therefore growers focus more on the spring planted sets.

For organic growers and for high disease pressure years the mildew resistant varieties offer potential – Santero was not in trial but commercially does well in areas where mildew is a problem.

There is a good range of maturities allowing growers to spread their harvest period.

Establishment was good due to above average temperatures in March. Set availability was a problem and some of the early material was not planted until later which will have reduced the benefit of them potentially maturing early, but they were still up to 3 weeks earlier. The full benefit of early sets comes from January/February plantings – generally on lighter soils on the Suffolk/Essex coastal land.

Jagro, Griffon, Troy and Red Arrow all had good early vigour. Red Arrow was late planted but very quickly caught up with the rest of the trial.

Forum, Spitfire, Troy and Red Arrow were the earliest maturing varieties. Early maturing varieties tend to be more prone to bolting. Red main crop varieties can also suffer if they do not receive sufficient heat treatment over the winter. Red Baron suffered from a high percentage of bolters. There was not much spread of maturities in the main crop varieties.

Very little mildew was seen and this only came into crops in late June / early July so there was little damage seen, especially on the early maturing varieties.

The mean trial yields were above the 10 year average due to the mild conditions and low disease pressure.

Jagro and Griffon were the highest yielding brown earlies. Red Arrow and Red Light were the highest yielding reds.

Spitfire and Forum had the best neck finishes.
Skin quality was generally poorer than on the main crop varieties but Spitfire, Alpha and Jagro had the best skin finishes of the early material.

Early material tends not to be suitable for storage and are thus not formally recorded. However the early material was put in ambient store and the Alpha was the best of the earlies observed. Of the brown maincrop varieties Setton and Sturon had the highest percentage of sound bulbs in April. Red Baron and Red Ray were the best of the reds.

There were quite a few rots in the harvested material and through storage. Fusarium base rots were higher than some years due to the warmer than average temperatures from March to July.

Trial records and data collected – drilled trials

Table D shows key areas of interest - selected yield storage data.
A full set of data tables is appended.

The trials were drilled in good conditions on 14th March (Norfolk) and 17th March (Essex).
The trials were harvested on 21st August (Norfolk) and 28th August (Essex). The 2014 season was mild and maturities were earlier than in 2012 and 2013. Many counties encountered mean temperatures above the long term averages for the months March to July which resulted in drilled crops being up to 3 weeks earlier but a cool August then delayed harvest slightly. This contrasted starkly with 2013 where cool and grey April, May and June meant that crops were slow growing, late maturing and some varieties were taken green. The 2012 season had been very wet at harvest and there were problems with high percentages of rots. Mildew was a problem in some areas of the country with the Norfolk trial being affected.

Table D. NIAB Spring Sown Onion Trials drilled from seed 2014 – Varieties, Maturities, Yield & Storage

Varieties in maturity order (mean of both sites); Main 3 replicates; *Preliminary 2 replicates of data*

Variety	Source	Maturity Date of 80% foliage fallover	Yield marketable (t/ha)	Ambient Storage % sound bulbs at end May	CE Storage % sound bulbs at end July
BROWNS					
Hybound (BGS266)	Bejo	04-Aug	71.9	26	34
Hybing	Bejo	04-Aug	76.3	25	21
Vision	Syngenta	07-Aug	71.1	42	57
Hypark	Bejo	07-Aug	71.0	24	28
Medaillon	Syngenta	08-Aug	63.5	31	34
Centro	Hazera	09-Aug	70.7	19	23
Wellington	Syngenta	09-Aug	72.0	36	55
Napoleon	Syngenta	10-Aug	69.9	25	26
Progression (ONL354)	*Syngenta*	*10-Aug*	67.9	44	31
Hysky (BGS289)	Bejo	10-Aug	73.7	36	44
Paradiso	Hazera	10-Aug	67.7	32	37
Motion	Syngenta	11-Aug	71.3	47	52
SV3557ND	Seminis	11-Aug	69.7	33	33
Arthur	Hazera	11-Aug	74.3	13	22
Chico (NIZ 37-89)	Hazera	11-Aug	59.3	33	37
RS07751481	Seminis	12-Aug	74.2	28	28
Mannito	Seminis	15-Aug	69.5	26	21
Hystore (BGS290)	Bejo	16-Aug	73.2	38	31
Santero	Hazera	17-Aug	69.2	16	21
Mean		**10-Aug**	**70.3**	**30**	**33**
REDS					
af 222	*Allium Farms*	*02-Aug*	64.2	26	32
af 1.11	Allium Farms	05-Aug	62.2	26	36
Red Planet	Allium Farms	05-Aug	54.8	36	33
Red Tide	Bejo	06-Aug	65.2	38	50
Red Light	Bejo	06-Aug	69.3	4	29
Redspark	Bejo	10-Aug	64.5	27	43
Red Baron	Bejo	12-Aug	64.8	22	35
af 1.75	Allium Farms	15-Aug	55.8	38	42
Retano	Hazera	17-Aug	62.6	15	51
Mean		**09-Aug**	**62.6**	**26**	**39**

***Discussion* - Drilled trials**

There is a good range of maturities allowing growers to spread their harvest period. In cooler years, such as 2013, the opportunities to harvest later maturing varieties can run over into October which can result in bulbs being harder to dry and some 'telescoping/tubing' occurring in material insufficiently dried.

For organic growers and for high disease pressure years the mildew resistant varieties offer potential – Santero was the highest yielding variety on the mildew affected Norfolk site.

Establishment was good, above average temperature in March through to July meant that growth was good and up to 3 weeks ahead of normal. Wet conditions in the 3rd week of August delayed harvest on some commercial crops.

Hybound and Hybing were the earliest maturing varieties of the drilled trials. Vision, Hypark and Centro are also at the earlier end of the spectrum. However some varieties will mature in a different sequence in seasons with different environmental factors such as the cooler 2013 season, Medaillon was earlier in 2014 than 2013.

Mildew was at low enough levels to be kept under control by regular fungicide applications in the Essex trial but the disease pressure was high in Norfolk and it was not possible to fully control mildew on the maturing crop. Plant breeders continue to breed mildew resistance into commercially viable new varieties.

The mean trial yield in Norfolk was below the 10 year average (56t/ha in 2014 compared with 62t/ha average) due to the mildew infections, while the yield in the cleaner Essex trial was above average (85t/ha in 2014, 67t/ha average).

In the Essex trial the highest yielding brown varieties were Hybing, Hysky and Arthur.
AF222 was the highest yielding red variety.

In the Norfolk trial Santero, RS07751481 and Hybing were the highest yielding browns.
Red Tide and Red Baron were the highest yielding red varieties.

There were quite a few rots in the harvested material of the Norfolk drilled trial. These were mainly Fusarium base rots.

Hybound, Hybing, Hypark, Hysky, Progression, Chico, AF1.11 and Red Planet were the best of the varieties for having high percentages of single centres. Hypark, Hysky and Chico all performed well in 2013.

Storage assessments in an ambient store were recorded in late April and late May 2015.

Storage potential continues to be a key factor for drilled crops. As in 2012/13 and 2013/14 Wellington, Vision and Hysky had above average percentages of sound bulbs at the late-May assessment. Progression, Motion and Hystore also performed above average in 2014/15. Red Planet, Red Tide and AF 1.75 performed well in the reds. Redspark and AF1.11 were average but had performed above average in previous years.

Stored bulb quality was generally very good throughout most of the varieties.

The highest percentage of sound bulbs from the controlled environment store was from Vision, as in previous years. Others which performed above the average were Wellington, Hysky, Motion, Paradiso and Chico. With the exception of Paradiso these were all above average in the previous season's trial.
Red Tide, Retano and Redspark had the highest percentage of sound bulbs in the reds.

Main Conclusions

The yield potential of varieties can vary greatly. In the drilled trials this was approx. 17t/ha between the highest and lowest yields (mean of both trials).

The yield data in the drilled trials is a good starting point for selecting varieties but other factors need to be considered.

Varieties should be selected on:

- maturity (to stagger the harvest season);
- storage potential (to extend the availability of UK onions) and yield out of store;
- disease resistance (i.e. mildew resistance);
- single centres (for onion ring production which attracts a premium).

Selected varieties have been commented on in the discussion section.

Set Varieties

Forum, Spitfire, Troy and Red Arrow were the earliest maturing varieties.
Jagro and Griffon were the highest yielding brown earlies. Red Arrow and Red Light were the highest yielding reds.
Spitfire and Forum had the best neck finishes.
Of the brown maincrop varieties Setton and Sturon had the highest percentage of sound bulbs in April. Red Baron and Red Ray were the best of the reds.

Drilled Varieties

Hybound and Hybing were the earliest maturing varieties.
The highest yielding varieties were different on the two sites but Hybing was high yielding on both sites. Wellington, Vision, Hysky, SV3700ND, Action, Red Planet, Red Tide and AF1.75 all had better than average storage potential in ambient store.

Financial Benefits

The yield potential of varieties can vary greatly. In the drilled trials this was over 20t/ha between the highest and lowest yields (mean of both trials).

Yield out of store is also important. Drilled material shows a difference of over 40% between the best and worst storage potential from ambient store and of approx. 35% from CE store.

Mildew resistant varieties require fewer and or cheaper fungicide programmes.

Action Points

- Select a range of varieties with different maturities to spread the harvest.
- Select varieties best suited to your storage facilities.
- For varieties not suited to long term storage growers must be able to sell their produce quickly.
- In high disease pressure years growers should take advantage of material with disease resistance e.g. mildew resistance.

Knowledge and Technology Transfer

Updates of trial data were circulated to levy payers by AHDB Horticulture and also to sponsoring breeders and seed companies.

Open days were also hosted on four occasions:

1. Set crop field open days in Suffolk and Lincs. – July 2014
2. Drilled crop field open day in Essex – August 2014
3. Main set and drilled crops harvested produce open day and conference at NIAB, Cambridge – November 2014

These events were well attended by growers, seed trade, agronomists, research providers, etc. The farming press always attend the open days and there was significant coverage of the results – particularly in The Vegetable Farmer and Horticulture Week.

Appendices

Table 1. NIAB Spring Planted Onion Trial from Sets 2014 - Varieties

Varieties in maturity order (mean of both sites)

			Maturity	Maturity
Variety	set source	Seed source	Date of 80% foliage fallover	Date of 80% foliage fallover
Early Browns			Lincs	Suffolk
Forum	Broer/Elsoms	Bejo/De Groot en Slot	-	27-Jun
Spitfire	*Allium Seeds UK Ltd*	*Allium Seeds UK Ltd*	-	*02-Jul*
Troy	Broer/Elsoms	Bejo/De Groot en Slot	-	02-Jul
Alpha	Allium Seeds UK Ltd	Allium Seeds UK Ltd	-	06-Jul
Jagro	English Set Company	Bejo/De Groot en Slot	-	16-Jul
Griffon	*Allium Seeds UK Ltd*	*Allium Seeds UK Ltd*	-	*21-Jul*
Early Reds				
Red Arrow	*Allium Seeds UK Ltd*	*Allium Seeds UK Ltd*	-	*12-Jul*
Maincrop Browns				
Rumba	Allium Seeds UK Ltd	Allium Seeds UK Ltd	22-Jul	17-Jul
VCS 6004	English Set Company	Confidential	24-Jul	18-Jul
VCS 6005	English Set Company	Confidential	24-Jul	18-Jul
Sturon	English Set Company	Confidential	26-Jul	19-Jul
Setton	Allium Seeds UK Ltd	Allium Seeds UK Ltd	26-Jul	22-Jul
Stur BC20	Broer/Elsoms	Bejo/De Groot en Slot	27-Jul	23-Jul
Maincrop Reds				
Red Baron (ELS)	Broer/Elsoms	Bejo/De Groot en Slot	13-Jul	26-Jul
Red Light F1	Broer/Elsoms	Bejo/De Groot en Slot	20-Jul	23-Jul
Red Ray F1	Broer/Elsoms	Bejo/De Groot en Slot	27-Jul	24-Jul
Garnet	Allium Seeds UK Ltd	Allium Seeds UK Ltd	27-Jul	25-Jul

Suffolk trial planted 25-Feb, except for Red Arrow, Red Baron, Red Light 13-Mar; Garnet 27-Mar; Red Ray 3-April.
Lincs. trial planted 11-Mar, except for Red Light 13-Mar; Red Baron, Garnet 20-Mar; Red Ray 4-April.

Table 2. NIAB Spring Planted Onion Trial from Sets 2014 – Yield data

Varieties in maturity order (mean of both sites)

Variety	Population & Yield											
	plant pop. (plants / sq. m)			marketable yield (t/ha)			% bulbs by weight > 60mm			% defects (not inc. rots)		
	Lincs	Suffk	Mean	Lincs	Suffk	Mean	Lincs	Suffk	Mean	Lincs	Suffk	Mean
Early Browns												
Forum		42.5	42.5		58.8	58.8		89.9	89.9		2.7	2.7
Spitfire		*41.1*	*41.1*		*54.2*	*54.2*		*84.4*	*84.4*		*4.0*	*4.0*
Troy		36.2	36.2		46.3	46.3		92.1	92.1		5.7	5.7
Alpha		38.8	38.8		64.2	64.2		87.3	87.3		2.0	2.0
Jagro		39.2	39.2		95.8	95.8		97.9	97.9		2.2	2.2
Griffon		*38.5*	*38.5*		*81.9*	*81.9*		*94.6*	*94.6*		*2.1*	*2.1*
Mean		**39.4**	**39.4**		**66.9**	**66.9**		91.0	91.0		**3.1**	**3.1**
Early Reds												
Red Arrow		*41.5*	*41.5*		*61.1*	*61.1*		*89.6*	*89.6*		*1.8*	*1.8*
Maincrop Browns												
Rumba	38.0	44.8	41.4	65.1	67.2	66.2	89.0	83.9	86.5	0.6	1.7	1.2
VCS 6004	40.3	44.3	42.3	61.9	69.4	65.6	82.2	85.8	84.0	0.7	1.7	1.2
VCS 6005	41.5	45.2	43.4	65.3	72.6	68.9	80.8	84.0	82.4	0.2	1.6	0.9
Sturon	39.1	45.3	42.2	64.0	70.2	67.1	86.9	85.8	86.4	0.5	0.9	0.7
Setton	39.7	42.6	41.2	67.4	68.4	67.9	87.6	85.6	86.6	0.0	0.2	0.1
Stur BC20	37.8	43.5	40.6	57.7	64.6	61.2	81.7	81.7	81.7	0.7	0.2	0.5
Mean	**39.4**	**44.3**	**41.8**	**63.6**	**68.7**	**66.1**	84.7	84.5	84.6	**0.5**	**1.0**	**0.8**
Maincrop Reds												
Red Baron (ELS)	38.7	39.9	39.3	53.7	41.9	47.8	79.2	69.3	74.3	2.0	13.7	7.9
Red Light F1	38.5	37.6	38.1	63.2	67.3	65.3	91.0	90.6	90.8	8.0	1.5	4.7
Red Ray F1	41.2	43.4	42.3	52.4	59.9	56.2	68.0	79.6	73.8	1.2	0.2	0.7
Garnet	40.1	43.6	41.9	60.4	53.8	57.1	84.3	77.0	80.6	5.2	3.9	4.5
Mean	**39.6**	**41.1**	**40.4**	**57.4**	**55.7**	**56.6**	80.6	79.1	79.9	**4.1**	**4.8**	**4.4**

Table 3. NIAB Spring Planted Onion Trial from Sets 2014 - rots by category

Varieties in maturity order (mean of both sites)

Variety	% Base Rots			% Neck Rots			% Bacterial Rots			% Penicllium		
	Lincs	Suffk	Mean	Lincs	Suffk	Mean	Lincs	Suffk	Mean	Lincs	Suffk	Mean
Early Browns												
Forum		0.7	0.7		13.6	13.6		2.5	2.5		0.7	0.7
Spitfire		*0.0*	*0.0*		*5.8*	*5.8*		*1.2*	*1.2*		*0.7*	*0.7*
Troy		3.8	3.8		12.8	12.8		6.9	6.9		0.2	0.2
Alpha		0.0	0.0		2.2	2.2		0.2	0.2		0.0	0.0
Jagro		0.3	0.3		0.2	0.2		0.0	0.0		0.0	0.0
Griffon		*0.8*	*0.8*		*1.6*	*1.6*		*1.8*	*1.8*		*0.0*	*0.0*
Mean		**0.9**	**0.9**		**6.0**	**6.0**		**2.1**	**2.1**		**0.3**	**0.3**
Early Reds												
Red Arrow		*1.1*	*1.1*		*7.2*	*7.2*		*1.5*	*1.5*		*4.5*	*4.5*
Maincrop Browns												
Rumba	0.2	3.8	2.0	1.6	1.1	1.3	0.7	0.9	0.8	0.2	0.3	0.2
VCS 6004	0.4	2.1	1.2	0.5	0.8	0.7	0.5	0.9	0.7	0.0	0.0	0.0
VCS 6005	0.0	1.7	0.9	1.2	0.0	0.6	0.2	1.1	0.7	0.0	0.0	0.0
Sturon	0.0	2.5	1.3	1.7	1.3	1.5	0.2	1.6	0.9	0.0	0.2	0.1
Setton	0.0	2.1	1.1	0.4	0.8	0.6	0.2	1.0	0.6	0.0	0.3	0.2
Stur BC20	0.0	2.4	1.2	0.4	1.2	0.8	0.0	0.3	0.2	0.0	0.3	0.2
Mean	**0.1**	**2.4**	**1.3**	**1.0**	**0.9**	**0.9**	**0.3**	**1.0**	**0.6**	**0.0**	**0.2**	**0.1**
Maincrop Reds												
Red Baron (ELS)	0.2	0.7	0.5	0.2	0.8	0.5	1.3	0.7	1.0	0.5	0.0	0.2
Red Light F1	0.0	1.9	0.9	3.3	2.1	2.7	0.0	2.8	1.4	0.0	0.0	0.0
Red Ray F1	0.0	0.5	0.2	1.0	0.2	0.6	0.2	0.5	0.3	0.0	0.2	0.1
Garnet	0.0	1.1	0.5	0.2	1.5	0.9	0.0	2.2	1.1	0.0	0.3	0.2
Mean	**0.0**	**1.0**	**0.5**	**1.2**	**1.1**	**1.2**	**0.4**	**1.5**	**1.0**	**0.1**	**0.1**	**0.1**

Table 4. NIAB Spring Planted Onion Trial from Sets 2014 – Bulb quality data

Varieties in maturity order (mean of both sites)

Variety	Neck Finish 1=fine 3=thick		Skin Colour 1=pale 9=dark		Skin Protection 1=poor 9=good		Bulb Shape 1=flat 5=round 9=elongate		Uniformity 1=poor 9=good		Firmness 1=poor 9=good	
	Lincs	Suffk	Lincs	Suffk	Lincs	Suffk	Lincs	Suffk	Lincs	Suffk	Lincs	Suffk
Early Browns												
Forum		1.5		7.0		4.0		4.5		6.5		6.0
Spitfire		*1.5*		*6.0*		*5.0*		*5.5*		*6.5*		*6.0*
Troy		2.0		7.0		4.0		5.0		7.0		7.0
Alpha		2.0		6.0		6.0		6.0		7.0		5.5
Jagro		2.5		6.0		5.0		5.0		6.5		6.5
Griffon		*2.0*		*6.0*		*4.0*		*5.5*		*6.5*		*6.5*
		1.9		6.3		4.7		5.3		6.7		6.3
Early Reds												
Red Arrow		*2.0*		*5.0*		*5.0*		*4.5*		*7.0*		*6.0*
Maincrop Browns												
Rumba	2.5	2.5	5.5	5.5	7.0	7.0	4.5	4.5	7.0	7.0	6.5	6.5
VCS 6004	2.5	2.5	5.5	6.0	7.0	7.0	4.5	4.5	7.0	7.0	6.0	6.5
VCS 6005	2.5	2.5	6.0	5.5	7.0	7.0	4.5	4.5	7.0	7.0	6.0	6.5
Sturon	2.5	2.0	6.0	5.5	7.0	7.0	5.0	5.0	7.0	7.0	6.5	7.0
Setton	2.5	2.5	5.5	5.5	7.0	7.0	5.0	5.0	7.0	7.0	6.0	6.5
Stur BC20	2.5	2.5	5.5	6.0	7.0	7.0	4.5	5.0	7.0	7.0	6.5	6.5
Mean	**2.5**	**2.4**	**5.7**	**5.7**	**7.0**	**7.0**	**4.7**	**4.8**	**7.0**	**7.0**	**6.3**	**6.6**
Maincrop Reds												
Red Baron (ELS)	2.5	2.5	7.0	7.0	7.0	7.0	4.5	4.0	7.0	6.5	7.0	6.5
Red Light F1	2.5	2.5	6.5	6.5	7.0	6.0	5.0	5.0	7.0	7.0	7.0	7.0
Red Ray F1	2.5	2.5	7.0	7.0	7.0	7.0	5.0	5.0	7.0	7.0	7.0	7.0
Garnet	2.5	2.5	7.0	7.0	7.0	7.0	5.0	5.0	7.0	7.0	7.0	7.0
Mean	**2.5**	**2.5**	**6.9**	**6.9**	**7.0**	**6.8**	**4.9**	**4.8**	**7.0**	**6.9**	**7.0**	**6.9**

Table 5. NIAB Spring Planted Onion Trial from Sets 2014 – Onion Ring Data

Varieties in maturity order (mean of both sites)

	% bulbs with single centres		
Variety	Lincs	Suffk	Mean
Early Browns			
Forum		11.1	11.1
Spitfire		*40.0*	*40.0*
Troy		13.3	13.3
Alpha		73.3	73.3
Jagro		22.2	22.2
Griffon		*33.3*	*33.3*
Mean		**32.2**	**32.2**
Early Reds			
Red Arrow		*90.9*	*90.9*
Maincrop Browns			
Rumba	51.1	48.9	50.0
VCS 6004	46.7	37.8	42.2
VCS 6005	53.3	44.4	48.9
Sturon	62.2	48.9	55.6
Setton	57.8	68.9	63.3
Stur BC20	80.0	62.2	71.1
Mean	**58.5**	**51.9**	**55.2**
Maincrop Reds			
Red Baron (ELS)	97.8	93.3	95.6
Red Light F1			
Red Ray F1	97.8	84.4	91.1
Garnet	88.9	86.7	87.8
Mean	**94.8**	**88.1**	**91.5**

Table 6. NIAB Spring Planted Onion Trial from Sets 2014 – Storage data (Ambient) Assessments Mar/Apr 2015

	March % sound			April % sound			April % sprouted		
	Lincs	Suffk	Mean	Lincs	Suffk	Mean	Lincs	Suffk	Mean
Maincrop Browns									
Rumba	75	67	71	32	38	35	60	35	48
VCS 6004	78	71	75	34	39	37	58	52	55
VCS 6005	69	69	69	28	25	27	61	59	60
Sturon	76	68	72	46	45	46	48	40	44
Setton	83	79	81	55	46	50	44	39	41
Stur BC20	63	64	64	20	19	19	77	73	75
mean	**74**	**70**	**72**	**36**	**35**	**36**	**58**	**50**	**54**
Maincrop Reds									
Red Baron	84	69	76	36	22	29	56	63	59
Red light	37	33	35	6	4	5	66	79	73
Red Ray	46	68	57	21	35	28	67	40	53
Garnet	87	67	77	24	26	25	72	67	69
mean	**64**	**59**	**61**	**22**	**22**	**22**	**65**	**62**	**64**

Table 7. NIAB Spring Planted Onion Trial from Sets 2014– Storage data (Ambient) Assessments Jan/Mar 2015

Variety	April quality (1-9) 1=poor			April Total % rots		
	Lincs	Suffk	Mean	Lincs	Suffk	Mean
Maincrop Browns						
Rumba	6.0	6.0	6.0	8	26	17
VCS 6004	7.0	5.7	6.3	7	10	8
VCS 6005	6.3	5.3	5.8	11	16	13
Sturon	6.3	6.3	6.3	6	15	10
Setton	6.7	6.0	6.3	1	15	8
Stur BC20	6.0	6.3	6.2	3	8	6
mean	**6.4**	**5.9**	**6.2**	**6**	**15**	**11**
Maincrop Reds						
Red Baron	6.7	6.3	6.5	8	15	12
Red light	6.0	5.0	5.5	28	17	22
Red Ray	7.0	7.0	7.0	12	24	18
Garnet	6.7	6.7	6.7	4	8	6
mean	**6.6**	**6.3**	**6.4**	**13**	**16**	**14**

Table 8. NIAB Spring Sown Onion Trials from seed 2014 – varieties

Sites: Rix (Essex) and Raker (Norfolk)
Varieties in maturity order (mean of both sites)
Preliminary varieties 2 replicates of data

			Maturity		
			Date of 80% foliage fallover		
Variety	Status	Source	Essex	Norfolk	Mean
BROWNS					
Hybound (BGS266)	R	Bejo	05-Aug	03-Aug	04-Aug
Hybing	C	Bejo	06-Aug	02-Aug	04-Aug
Vision	C	Syngenta	06-Aug	07-Aug	07-Aug
Hypark	R	Bejo	06-Aug	09-Aug	07-Aug
Medaillon	3	Syngenta	09-Aug	08-Aug	08-Aug
Centro	C	Hazera	06-Aug	12-Aug	09-Aug
Wellington	R	Syngenta	07-Aug	11-Aug	09-Aug
Napoleon	R	Syngenta	10-Aug	10-Aug	10-Aug
Progression (ONL354)	*P*	*Syngenta*	*08-Aug*	*13-Aug*	*10-Aug*
Hysky (BGS289)	1	Bejo	07-Aug	14-Aug	10-Aug
Paradiso	2	Hazera	07-Aug	14-Aug	10-Aug
Motion	R	Syngenta	09-Aug	13-Aug	11-Aug
SV3557ND	1	Seminis	12-Aug	10-Aug	11-Aug
Arthur	C	Hazera	09-Aug	13-Aug	11-Aug
Chico (NIZ 37-89)	2	Hazera	09-Aug	13-Aug	11-Aug
RS07751481	2	Seminis	13-Aug	10-Aug	12-Aug
Mannito	R	Seminis	16-Aug	15-Aug	15-Aug
Hystore (BGS290)	1	Bejo	18-Aug	15-Aug	16-Aug
Santero	R	Hazera	17-Aug	17-Aug	17-Aug
Mean			**09-Aug**	**11-Aug**	**10-Aug**
REDS					
af 222	*P(2)*	*Allium Farms*	*29-Jul*	*07-Aug*	*02-Aug*
af 1.11	*1*	Allium Farms	03-Aug	06-Aug	05-Aug
Red Planet	3	Allium Farms	04-Aug	07-Aug	05-Aug
Red Tide	R	Bejo	04-Aug	07-Aug	06-Aug
Red Light	2	Bejo	05-Aug	08-Aug	06-Aug
Redspark	C	Bejo	07-Aug	13-Aug	10-Aug
Red Baron	C	Bejo	10-Aug	14-Aug	12-Aug
af 1.75	2	Allium Farms	16-Aug	14-Aug	15-Aug
Retano	4	Hazera	18-Aug	17-Aug	17-Aug
Mean			**07-Aug**	**10-Aug**	**09-Aug**

Table 9. NIAB Spring Sown Onion Trials from seed 2014- Yield data

Sites: Rix (Essex) and Raker (Norfolk)
Varieties in maturity order (mean of both sites)
Preliminary varieties 2 replicates of data

	Population & Yield											
Variety	plant pop. (plants / sq. m)			marketable yield (t/ha)			% bulbs by weight >60mm			total % defects (excl. rots)		
	Rix	Raker	Mean	Rix	Raker	Mean	Rix	Raker	Mean	Rix	Raker	Mean
BROWNS												
Hybound	57.9	49.9	53.9	86.7	57.1	71.9	81.9	61.9	71.9	0.8	0.1	0.4
Hybing	52.8	49.2	51.0	91.9	60.7	76.3	90.2	75.3	82.8	0.7	0.3	0.5
Vision	50.5	54.2	52.3	85.3	56.9	71.1	86.5	63.6	75.1	1.7	0.0	0.9
Hypark	53.9	50.6	52.3	89.2	52.8	71.0	86.9	57.4	72.2	0.8	0.0	0.4
Medaillon	44.2	44.4	44.3	76.6	50.5	63.5	91.8	74.0	82.9	0.0	0.2	0.1
Centro	54.5	47.9	51.2	85.1	56.3	70.7	84.4	65.2	74.8	1.2	0.6	0.9
Wellington	50.0	48.1	49.0	87.8	56.1	72.0	89.1	68.7	78.9	0.6	0.0	0.3
Napoleon	52.2	51.4	50.7	87.8	52.0	69.9	87.7	48.8	68.2	0.1	0.0	0.1
Progression	*50.1*	*51.1*	*50.6*	*78.2*	*57.6*	*67.9*	*86.3*	*58.6*	*72.4*	*3.9*	*0.2*	*2.0*
Hysky	52.5	51.2	51.9	90.6	56.7	73.7	89.5	58.4	74.0	1.2	0.2	0.7
Paradiso	53.8	47.4	50.6	81.4	54.0	67.7	84.2	65.1	74.7	3.0	1.1	2.1
Motion	46.4	44.8	45.6	85.9	56.7	71.3	90.8	76.5	83.6	0.6	0.0	0.3
SV3557ND	53.9	46.3	50.1	84.5	54.9	69.7	84.6	66.5	75.5	0.4	0.0	0.2
Arthur	52.2	49.0	50.6	89.8	58.7	74.3	89.1	64.8	76.9	1.6	0.7	1.1
Chico	51.4	48.2	49.8	75.3	43.3	59.3	82.2	56.5	69.3	0.7	0.8	0.7
RS07751481	49.3	52.3	50.8	88.0	60.5	74.2	90.2	63.8	77.0	0.7	0.4	0.6
Mannito	44.0	46.2	45.1	82.4	56.7	69.5	90.9	71.2	81.1	0.7	0.5	0.6
Hystore	52.8	49.2	51.0	87.7	58.8	73.2	86.5	64.9	75.7	0.2	0.0	0.1
Santero	35.9	42.0	38.9	72.6	65.9	69.2	91.2	90.3	90.8	0.2	0.0	0.1
Mean	50.4	48.6	49.5	84.6	56.1	70.3	87.6	65.9	76.7	1.0	0.3	0.6
REDS												
af 222	*48.2*	*42.6*	*45.4*	*76.4*	*52.0*	*64.2*	*86.0*	*67.3*	*76.6*	*0.2*	*0.3*	*0.3*
af 1.11	46.0	49.8	47.9	68.6	55.8	62.2	82.0	55.6	68.8	0.0	0.0	0.0
Red Planet	47.3	47.4	47.4	67.1	42.6	54.8	78.7	44.5	61.6	0.3	0.3	0.3
Red Tide	42.0	49.2	45.6	71.2	59.2	65.2	85.7	66.1	75.9	0.0	0.0	0.0
Red Light	41.0	43.4	42.2	84.4	54.3	69.3	95.0	79.5	87.3	1.2	0.2	0.7
Redspark	48.9	44.1	46.5	75.2	53.7	64.5	81.7	66.6	74.2	0.0	0.0	0.0
Red Baron	45.2	48.7	47.0	71.6	58.0	64.8	85.4	64.8	75.1	0.3	0.2	0.2
af 1.75	42.5	42.9	42.7	68.4	43.2	55.8	86.8	69.6	78.2	2.2	0.0	1.1
Retano	50.1	51.1	50.6	68.3	56.9	62.6	75.9	56.5	66.2	0.1	0.3	0.2
Mean	45.7	46.6	46.1	72.4	52.9	62.6	84.1	63.4	73.8	0.5	0.1	0.3

Table 10. NIAB Spring Sown Onion Trials from seed 2014 - rots by category

Sites: Rix (Essex) and Raker (Norfolk)
Varieties in maturity order (mean of both sites)
Preliminary varieties 2 replicates of data

	Population & Yield											
Variety	% Base Rots			% Neck Rots			% bacterial rots			% Penicllium		
	Rix	Raker	Mean	Rix	Raker	Mean	Rix	Raker	Mean	Rix	Raker	Mean
BROWNS												
Hybound	0.0	6.5	3.2	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Hybing	0.0	10.8	5.4	0.0	0.0	0.0	0.3	0.0	0.1	0.0	0.0	0.0
Vision	0.2	11.0	5.6	0.2	0.0	0.1	0.2	0.0	0.1	0.0	0.0	0.0
Hypark	0.0	9.5	4.8	0.0	0.0	0.0	0.0	2.3	1.1	0.0	0.0	0.0
Medaillon	0.5	9.8	5.2	0.0	0.3	0.2	0.9	4.5	2.7	0.0	0.0	0.0
Centro	0.0	3.2	1.6	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0
Wellington	0.0	7.1	3.5	0.0	0.1	0.1	0.4	0.6	0.5	0.0	0.0	0.0
Napoleon	0.0	4.3	2.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Progression	*0.0*	*1.8*	*0.9*	*0.2*	*0.0*	*0.1*	*0.2*	*0.0*	*0.1*	*0.0*	*0.0*	*0.0*
Hysky	0.0	1.1	0.6	0.1	0.1	0.1	0.3	0.7	0.5	0.0	0.0	0.0
Paradiso	0.5	6.9	3.7	0.0	0.0	0.0	0.6	0.3	0.4	0.0	0.0	0.0
Motion	0.3	5.5	2.9	0.0	0.0	0.0	1.2	0.0	0.6	0.0	0.0	0.0
SV3557ND	0.0	5.7	2.8	0.1	0.0	0.1	0.0	0.6	0.3	0.0	0.0	0.0
Arthur	0.4	5.1	2.7	0.0	0.2	0.1	0.4	0.0	0.2	0.0	0.0	0.0
Chico	0.3	10.5	5.4	0.0	0.0	0.0	0.1	2.2	1.2	0.0	0.0	0.0
RS07751481	0.0	3.9	1.9	0.2	0.1	0.1	0.4	0.0	0.2	0.0	0.0	0.0
Mannito	0.0	4.7	2.4	0.6	0.0	0.3	1.4	0.3	0.9	0.0	0.0	0.0
Hystore	0.0	2.4	1.2	0.3	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0
Santero	0.0	8.9	4.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mean	0.1	6.2	3.2	0.1	0.0	0.1	0.3	0.6	0.5	0.0	0.0	0.0
REDS												
af 222	*0.0*	*2.8*	*1.4*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
af 1.11	0.2	2.4	1.3	0.0	0.0	0.0	0.0	0.6	0.3	0.0	0.0	0.0
Red Planet	0.1	9.2	4.7	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0
Red Tide	0.0	1.5	0.7	0.2	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.0
Red Light	0.0	14.6	7.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Redspark	0.0	1.2	0.6	0.0	0.2	0.1	0.0	0.7	0.3	0.0	0.0	0.0
Red Baron	0.0	1.1	0.5	0.0	0.0	0.0	0.0	0.3	0.2	0.0	0.0	0.0
af 1.75	0.2	21.0	10.6	0.0	0.0	0.0	0.2	0.0	0.1	0.0	0.0	0.0
Retano	0.0	2.5	1.3	0.0	0.0	0.0	0.6	0.0	0.3	0.0	0.0	0.0
Mean	0.1	6.2	3.1	0.0	0.0	0.0	0.1	0.2	0.1	0.0	0.0	0.0

Table 11. NIAB Spring Onion Trials from seed 2014 – Bulb Quality data

Sites: Rix (Essex) and Raker (Norfolk)
Varieties in maturity order (mean of both sites)
Preliminary varieties 2 replicates of data

	Bulb Quality (1-9)														
Variety	Skin Colour 1=pale 9=dark			Skin Protection 1=poor 9=good			Bulb Shape 1=flat 5=round 9=elongate			Uniformity 1=poor 9=good			Firmness 1=poor 9=good		
	Rix	Raker	Av	Rix	Raker	Av	Rix	Raker	Av	Rix	Raker	Av	Rix	Raker	Av
BROWNS															
Hybound	6.0	6.0	6.0	7.0	7.0	7.0	5.0	5.0	5.0	7.0	6.0	6.5	7.0	7.0	7.0
Hybing	6.0	5.5	5.8	7.0	7.0	7.0	5.0	5.0	5.0	6.0	6.5	6.3	7.0	7.0	7.0
Vision	5.5	5.5	5.5	7.0	7.0	7.0	5.0	4.5	4.8	7.0	7.0	7.0	7.0	7.0	7.0
Hypark	5.0	5.5	5.3	7.0	7.0	7.0	5.0	5.0	5.0	7.0	7.0	7.0	7.0	7.0	7.0
Medaillon	5.5	5.5	5.5	7.0	7.0	7.0	5.0	5.0	5.0	6.5	6.5	6.5	7.0	7.0	7.0
Centro	5.0	5.5	5.3	7.0	7.0	7.0	5.0	4.5	4.8	6.5	7.0	6.8	7.0	7.0	7.0
Wellington	5.0	5.5	5.3	7.0	7.0	7.0	5.0	4.5	4.8	7.0	6.5	6.8	7.0	7.0	7.0
Napoleon	5.0	5.5	5.3	7.0	7.0	7.0	5.0	5.0	5.0	6.5	7.0	6.8	7.0	7.0	7.0
Progression	5.5	6.0	5.8	7.0	7.0	7.0	5.0	5.0	5.0	7.0	7.0	7.0	7.0	7.0	7.0
Hysky	6.0	6.5	6.3	7.0	7.0	7.0	5.0	5.0	5.0	6.5	6.5	6.5	7.0	7.0	7.0
Paradiso	6.0	5.5	5.8	7.0	7.0	7.0	5.0	5.0	5.0	7.0	7.0	7.0	7.0	7.0	7.0
Motion	5.5	5.5	5.5	7.0	7.0	7.0	5.0	5.0	5.0	7.0	7.0	7.0	7.0	7.0	7.0
SV3557ND	5.5	5.5	5.5	7.0	7.0	7.0	5.0	5.0	5.0	6.5	7.0	6.8	7.0	7.0	7.0
Arthur	5.5	5.0	5.3	7.0	7.0	7.0	5.0	5.0	5.0	6.5	7.0	6.8	7.0	7.0	7.0
Chico	5.5	6.5	6.0	7.0	7.0	7.0	5.0	5.0	5.0	7.0	7.0	7.0	7.0	7.0	7.0
RS07751481	5.0	5.5	5.3	7.0	7.0	7.0	5.0	4.5	4.8	7.0	6.5	6.8	7.0	7.0	7.0
Mannito	5.0	5.5	5.3	7.0	7.0	7.0	5.0	5.0	5.0	6.5	7.0	6.8	7.0	7.0	7.0
Hystore	5.5	5.5	5.5	7.0	7.0	7.0	5.0	5.0	5.0	6.0	6.5	6.3	7.0	7.0	7.0
Santero	6.0	5.5	5.8	7.0	7.0	7.0	5.0	5.0	5.0	6.5	7.0	6.8	7.0	7.0	7.0
Mean	5.5	5.6	5.6	7.0	7.0	7.0	5.0	4.9	4.9	6.7	6.8	6.7	7.0	7.0	7.0
REDS															
af 222	5.5	6.0	5.8	7.0	7.0	7.0	5.0	5.0	5.0	6.5	6.5	6.5	7.0	7.0	7.0
af 1.11	5.0	6.0	5.5	7.0	7.0	7.0	5.0	5.0	5.0	6.5	6.5	6.5	7.0	7.0	7.0
Red Planet	5.0	5.5	5.3	7.0	7.0	7.0	5.0	5.0	5.0	6.5	6.5	6.5	7.0	7.0	7.0
Red Tide	6.0	7.0	6.5	7.0	7.0	7.0	5.0	5.0	5.0	6.5	6.5	6.5	7.0	7.0	7.0
Red Light	6.0	6.5	6.3	7.0	7.0	7.0	5.5	5.0	5.3	6.5	6.5	6.5	7.0	7.0	7.0
Redspark	6.0	7.0	6.5	7.0	7.0	7.0	5.0	5.0	5.0	6.5	6.5	6.5	7.0	7.0	7.0
Red Baron	6.5	7.0	6.8	7.0	7.0	7.0	5.0	5.0	5.0	6.5	6.5	6.5	7.0	7.0	7.0
af 1.75	6.0	6.5	6.3	7.0	7.0	7.0	5.0	5.0	5.0	6.5	6.5	6.5	7.0	7.0	7.0
Retano	6.5	6.5	6.5	7.0	7.0	7.0	5.0	5.0	5.0	6.5	6.5	6.5	7.0	7.0	7.0
Mean	5.8	6.4	6.1	7.0	7.0	7.0	5.1	5.0	5.0	6.5	6.5	6.5	7.0	7.0	7.0

Table 12. NIAB Spring Sown Trials from seed 2014 – vigour and plant characteristics

Sites: Rix (Essex) and Raker (Norfolk)
Varieties in maturity order (mean of both sites)
Preliminary varieties 2 replicates of data
Both trials had a full fungicide programme so mildew is only recorded as present or absent at Norfolk and as the maximum percentage recorded in Essex

	Early vigour 1-9 9=vigorous			Establishment %			Habit/density (July) 1-9 9=dense			Mildew @ Raker (%)	
variety	Rix	Raker	Mean	Rix	Raker	Mean	Rix	Raker	Mean	23/7	7/8
BROWNS											
Hybound	7.0	8.0	7.5	7.0	7.0	7.0	-	7.3	7.3	5	n/a
Hybing	7.0	8.0	7.5	7.0	7.0	7.0	-	7.7	7.7	5	n/a
Vision	7.0	7.3	7.2	7.0	7.0	7.0	-	8.0	8.0	2	10
Hypark	7.0	7.3	7.2	7.0	7.0	7.0	-	7.3	7.3	2	20
Medaillon	7.0	7.0	7.0	7.0	7.0	7.0	-	7.0	7.0	2	15
Centro	7.0	7.3	7.2	7.0	7.0	7.0	-	7.3	7.3	2	12
Wellington	7.0	7.0	7.0	7.0	7.0	7.0	-	8.0	8.0	2	17
Napoleon	7.0	7.0	7.0	7.0	7.0	7.0	-	7.0	7.0	7	20
Progression	*7.0*	*7.0*	*7.0*	*6.5*	*7.0*	*6.8*	-	*7.5*	*7.5*	*6*	*23*
Hysky	7.0	7.3	7.2	7.0	7.0	7.0	-	7.3	7.3	5	25
Paradiso	7.0	7.3	7.2	6.7	7.0	6.8	-	7.0	7.0	4	13
Motion	7.0	7.7	7.3	7.0	7.0	7.0	-	6.3	6.3	4	20
SV3557ND	7.0	7.3	7.2	7.0	7.0	7.0	-	6.7	6.7	2	13
Arthur	7.0	7.3	7.2	7.0	7.0	7.0	-	7.7	7.7	2	13
Chico	7.0	7.0	7.0	6.7	7.0	6.8	-	7.0	7.0	1	13
RS07751481	7.0	7.3	7.2	6.7	7.0	6.8	-	7.3	7.3	2	10
Mannito	7.0	7.3	7.2	6.3	6.7	6.5	-	7.0	7.0	2	13
Hystore	7.0	7.0	7.0	7.0	7.0	7.0	-	7.0	7.0	2	12
Santero	7.0	6.7	6.8	6.3	7.0	6.7	-	6.3	6.3	0	1
Mean	**7.0**	**7.3**	**7.1**	**6.9**	**7.0**	**6.9**	-	**7.2**	**7.2**	3	15
REDS											
af 222	*7.0*	*7.0*	*7.0*	*6.5*	*7.0*	*6.8*	-	*8.0*	*8.0*	*8*	*n/a*
af 1.11	6.3	6.7	6.5	7.0	6.7	6.8	-	7.7	7.7	5	20
Red Planet	6.7	7.0	6.8	6.7	6.7	6.7	-	8.0	8.0	1	n/a
Red Tide	7.0	7.7	7.3	7.0	7.0	7.0	-	7.7	7.7	5	10
Red Light	7.0	7.3	7.2	7.0	6.7	6.8	-	8.0	8.0	7	30
Redspark	7.0	7.3	7.2	6.7	7.0	6.8	-	8.0	8.0	5	18
Red Baron	7.0	7.3	7.2	7.0	7.0	7.0	-	8.0	8.0	2	15
af 1.75	6.7	7.0	6.8	6.7	7.0	6.8	-	7.3	7.3	4	18
Retano	7.0	7.0	7.0	6.7	7.0	6.8	-	7.3	7.3	4	10
Mean	**6.9**	**7.2**	**7.1**	**6.8**	**6.9**	**6.9**	-	**7.4**	**7.4**	3	14

Table 13. NIAB Spring Sown Onion Trials from seed 2014 - Onion Ring Data

Sites: Rix (Essex) and Raker (Norfolk)
Varieties in maturity order (mean of both sites)
Preliminary varieties 2 replicates of data

	% Bulbs with single centres		
Variety	Essex	Norfolk	Mean
BROWNS			
Hybound	73.3	93.3	83.3
Hybing	75.6	82.2	78.9
Vision	28.9	75.6	52.2
Hypark	86.7	93.3	90.0
Medaillon	53.3	66.7	60.0
Centro	68.9	66.7	67.8
Wellington	48.9	86.7	67.8
Napoleon	33.3	70.0	51.7
Progression	*83.3*	*80.0*	*81.7*
Hysky	64.4	93.3	78.9
Paradiso	64.4	84.4	74.4
Motion	55.6	74.8	65.2
SV3557ND	64.4	84.4	74.4
Arthur	44.4	80.7	62.6
Chico	80.0	97.8	88.9
RS07751481	48.9	80.0	64.4
Mannito	51.1	60.0	55.6
Hystore	57.8	91.1	74.4
Santero	53.3	46.7	50.0
Mean	**59.8**	**79.4**	**69.6**
REDS			
af 222	*43.3*	*75.6*	*59.4*
af 1.11	88.9	84.4	86.7
Red Planet	73.3	86.7	80.0
Red Tide	37.8	77.8	57.8
Red Light	31.1	66.7	48.9
Redspark	51.1	60.0	55.6
Red Baron	46.7	68.9	57.8
af 1.75	66.7	68.9	67.8
Retano	51.1	62.2	56.7
Mean	**54.4**	**72.3**	**63.4**

Table 14. NIAB Spring Sown Onion Trials from seed 2014 – Storage data (Ambient) Assessments April/May 2015

Sites: Rix (Essex) and Raker (Norfolk)
Varieties in maturity order (mean of both sites)
Preliminary varieties 2 replicates of data

Variety	% sound Late April			% sound Late May			% sound CE storage late July
	Rix	Raker	Mean	Rix	Raker	Mean	Rix
BROWNS							
Hybound	79	56	68	35	17	26	34
Hybing	65	50	57	28	23	25	21
Vision	89	65	77	54	31	42	57
Hypark	77	71	74	35	14	24	28
Medaillon	67	65	66	38	24	31	34
Centro	76	38	57	28	10	19	23
Wellington	83	82	82	42	30	36	55
Napoleon	78	55	67	32	19	25	26
Progression	72	79	75	52	36	44	31
Hysky	79	73	76	49	23	36	44
Paradiso	75	55	65	38	25	32	37
Motion	84	80	82	54	39	47	52
SV3557	79	61	70	38	28	33	33
Arthur	38	41	40	14	12	13	22
NIZ 37-89	53	83	68	37	29	33	37
RS1481	81	62	71	41	14	28	28
Mannito	75	49	62	34	17	26	21
Hystore	90	71	81	47	28	38	31
Santero	63	44	53	20	11	16	21
Means	**74**	**62**	**68**	**38**	**23**	**30**	**33**
REDS							
af 222	66	91	78	28	23	26	32
af 1.11	60	70	65	23	29	26	36
Red Planet	77	71	74	37	35	36	33
Red Tide	86	67	76	36	40	38	50
Red Light	20	11	15	6	2	4	29
Redspark	71	74	72	30	25	27	43
Red Baron	83	66	74	25	19	22	35
af 1.75	76	57	67	41	35	38	42
Retano	70	47	58	15	15	15	51
Means	**67**	**61**	**64**	**27**	**25**	**26**	**39**