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[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 mildew resistance.

Background

The aim of the work is to provide independent assessment of the growing habits, 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.

Drilled onions account for approximately 70% of the area grown in the UK and early maturing varieties such as Hybing, Hybound, Centro and Vision are popular. New material is competing to take a share of the early maturing variety market. Early maincrop varieties hold the majority of the acreage but mid-range and late maturing varieties still hold a proportion. However, in cool seasons late maturing varieties are only likely to mature properly on fertile soils. A range of maturities plays an important part in spreading the harvest window. Red Baron still commands a large but diminishing percentage of the red area with Redspark, Red Tide and Retano gaining popularity.

Onion set crops account for the majority of the remaining 30% of the acreage grown. Overwintered onions are still grown but there are not enough varieties to warrant evaluation trials.

Results of the Variety Trials

Results – Drilled Onions

Trial records and data collected –onion trials drilled from seed

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 and at P G Rix in commercial cold 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 6th September (Norfolk) and 13th September (Essex). The 2017 season maturities were over two weeks earlier than the 10 year average while 2016 season was only 3 days earlier than the average.

Mildew was a present in both trials but does not seem to have had a major impact on yield.

Table A. NIAB Spring Sown Onion Trials drilled from seed 2017 – Varieties, Maturities, Yield & Storage

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

Storage Essex site only

Variety	Source	Maturity Date of 80% foliage fallow	Yield marketable (t/ha)	Ambient Storage % sound bulbs at end May	Cold Storage % sound bulbs at end July
BROWNS					
Drytan	Bejo/DGS	03-Aug	94.0	80	68
Hybound	Bejo/DGS	04-Aug	90.0	47	43
Fasto	Hazera	05-Aug	88.5	66	28
Hybing	Bejo/DGS	07-Aug	96.5	37	22
Hysky	Bejo/DGS	09-Aug	96.4	60	42
Hypark	Bejo/DGS	10-Aug	98.2	48	24
SV3557ND	Agility/Seminis	10-Aug	89.4	45	30
SVND 0363	Agility/Seminis	10-Aug	88.1	36	25
Centro	Hazera	11-Aug	88.3	43	26
Hytech	Bejo/DGS	11-Aug	98.8	41	45
Packito	Agility/Seminis	11-Aug	88.8	50	19
Medaillon	Syngenta	12-Aug	85.2	70	50
Vision	Syngenta	14-Aug	87.0	62	73
Bennito	Agility/Seminis	14-Aug	85.4	25	18
Hyway	Bejo/DGS	14-Aug	100.1	74	72
SVND0367	Agility/Seminis	14-Aug	88.7	67	50
Hyfive	Bejo/DGS	15-Aug	97.1	52	63
Hylander	Bejo/DGS	15-Aug	97.4	52	48

SVND7772	Agility/Seminis	15-Aug	98.3	72	47
SVND7599	Agility/Seminis	16-Aug	98.4	38	19
Chico	Hazera	17-Aug	86.0	59	51
Bossito	Agility/Seminis	18-Aug	85.0	51	39
Santero	Hazera	18-Aug	83.2	31	21
Elista	ProVeg	19-Aug	71.6	47	36
Motion	Syngenta	20-Aug	92.2	66	47
means		12-Aug	90.1	53	40
REDS					
Karminka	ProVeg	30-Jul	64.0	12	19
Red Light	Bejo/DGS	05-Aug	92.6	7	28
37-222	Hazera	07-Aug	73.6	40	12
Red Tide	Bejo/DGS	08-Aug	83.0	75	48
Retano	Hazera	09-Aug	72.2	56	50
37-111	Hazera	10-Aug	73.4	59	33
Red Herald	Allium Seeds	13-Aug	77.3	56	44
Red Baron	Allium Seeds	13-Aug	81.5	48	41
Red Baron	Bejo/DGS	15-Aug	84.6	50	31
Redspark	Bejo/DGS	15-Aug	80.8	46	28
means		09-Aug	78.3	45	34

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. However, 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.

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 in 2014 – both of the 2017 trials had significant levels of mildew.

Establishment was good. Seed beds at both sites had good tilth and the trial seed was drilled into moisture. The growing season started with a cool, dry spring followed by a mini heatwave in May and then a warm but wet summer. Crops matured earlier than usual.

Drytan, Hybound, Fasto and Hybing were the earliest maturing brown varieties of the drilled trials. Red Light and Karminka were the earliest of the reds.

The mean of trial yields in Norfolk was 82t/ha browns and 74t/ha reds, the mildew came in late enough not to have been a major contributing factor to the green plot yields.

The Essex trial yield means were 98t/ha browns and 83t/ha reds. Again the mildew did not severely impact upon the green plot yields.

The highest yielding brown varieties were Hyway, Hytech and Hypark. Red Light and Red Baron were the highest yielding red varieties.

There were a small percentage of bacterial rots and physical defects (splitting) in the harvested material from Essex, but very few Fusarium rots observed and this was reflected in the storage results. Fusarium remains an issue in commercial crops.

SV3557ND, Hypark and Drytan were the best of the brown varieties for having high percentages of single centres. Karminka, 37-222 and Red Tide were the best of the reds for single centres. Hybound, Hyway, Packito and Chico have had high percentages of single centres in two of the last 3 years.

Storage assessments in an ambient store were recorded in late-April and late-May 2018. Cold storage assessments were recorded in July 2018.

Storage potential continues to be a key factor for drilled crops.

Drytan, Hyway, SVND7772 and Medaillon all performed significantly above average in 2017/18. Drytan, Medaillon, Hyway, and Vision have consistently had above average percentages of sound bulbs at the late-May assessment. Red Tide and 37-111 performed well in the reds.

In cold storage the varieties Drytan, Vision, Hyway and Hyfive were the best brown varieties for storage. Red Tide and Retano were the best performing of the red varieties.

Stored bulb quality was generally very good throughout most of the brown varieties but the reds showed more softening.

Main Conclusions

Drilled Trials

Varieties need to match the grower's requirements and ideally have two or more above average characteristics e.g. for early maturity and high green plot yields, Hybound and Hypark are suitable choices; for green plot yield and post storage yields Hyway performed well – Medaillon and Vision performed well in previous years. Fasto, Chico and SV3557ND are newer varieties to keep an eye on over the next couple of seasons.

In the drilled trials there was approx. 29t/ha between the highest and lowest yields (mean of both trials).

Drilled material showed a difference of over 70%, between the best and worst storage potential from ambient store and of approximately 60% from cold storage.

Mildew resistant varieties should require fewer and or cheaper fungicide programmes.

Action Points

- Select a range of varieties according to soil type, desired harvest period, habit vigour and disease tolerance
- Select varieties best suited to your storage facilities
- Varieties should match the market and available storage facilities – longer storing varieties give more options
- In high disease pressure years growers material with good disease resistance e.g. mildew resistance – grow a range of varieties and use local knowledge of fields that could be disease hot spots
- Seed cost is a factor in the selection of varieties

SCIENCE SECTION

Introduction

The aim of the work is to provide independent assessment of the growth habit, yield, quality and storage potential of new onion varieties, propagated from seed, to 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. Established varieties are included to give comparison with newer varieties and to evaluate performance stability.

Varieties can perform very differently in the United Kingdom from Holland and other parts of mainland Europe. Breeding companies have central breeding programmes and will trial their varieties in a number of countries to find the ones that are most suitable to the local conditions and growing practices. UK trial field and storage data is essential for growers to make informed decisions when selecting varieties.

Drilled onions account for approximately 70% of the area grown in the UK. Early maturing varieties such as Hybing, Hybound, Centro and Vision are popular. New material is competing to take a share of the early maturing variety market. Early main crop varieties hold the majority of the acreage but mid-range and late maturing varieties still hold a proportion. However, in cool seasons late maturing varieties are only likely to mature properly on fertile soils. A range of maturities can play an important part in spreading the harvest window. Red Baron still commands a large but diminishing percentage of the red area with Redspark, Red Tide and Retano gaining popularity.

Onion set crops account for the majority of the remaining 30% of the area grown. Set crops provide earliness, extend the establishment period and are options on land with high blow risk and/or weed burden. Early crops avoid potentially challenging autumn harvest conditions and the earliest of these can attract a premium. Newer varieties 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. For set variety results the last trials were in 2016.

Overwintered onions are still grown but there are not enough varieties to warrant evaluation trials.

Table B. NIAB Spring Sown Onion Trials drilled from seed 2017 – Varieties, Maturities, Yield & Storage (Varieties and numbered selections included)

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

Storage Essex site only

Variety	Source	Maturity Date of 80% foliage fallover	Yield marketable (t/ha)	Ambient Storage % sound bulbs at end May	Cold Storage % sound bulbs at end July
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Hytech	Bejo/DGS	11-Aug	98.8	41	45
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SVND7599	Agility/Seminis	16-Aug	98.4	38	19
Chico	Hazera	17-Aug	86.0	59	51
Bossito	Agility/Seminis	18-Aug	85.0	51	39
Santero	Hazera	18-Aug	83.2	31	21
Elista	ProVeg	19-Aug	71.6	47	36
Motion	Syngenta	20-Aug	92.2	66	47
means		12-Aug	90.1	53	40
REDS					
Karminka	ProVeg	30-Jul	64.0	12	19
Red Light	Bejo/DGS	05-Aug	92.6	7	28
37-222	Hazera	07-Aug	73.6	40	12
Red Tide	Bejo/DGS	08-Aug	83.0	75	48
Retano	Hazera	09-Aug	72.2	56	50
37-111	Hazera	10-Aug	73.4	59	33
Red Herald	Allium Seeds	13-Aug	77.3	56	44
Red Baron	Allium Seeds	13-Aug	81.5	48	41
Red Baron	Bejo/DGS	15-Aug	84.6	50	31

Redspark	Bejo/DGS	15-Aug	80.8	46	28
means		09-Aug	78.3	45	34

Trial site details

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

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

- Raker Farms, Croxton, Norfolk – drilled onions on a Breckland soil
- P G Rix Farms, nr Colchester, Essex – drilled onions on a silty soil

Production details

The trials were drilled on 11th March (Norfolk) and 21st March (Essex) and were harvested on 6th September (Norfolk) and 13th September (Essex).

Trial design

The trial designs were randomised complete block. The main trials had 3 replicates and the preliminary varieties only 2 replicates which were randomised with the first two replicates of the main trial.

Trial records and data collected

The 2017 season average maturities of brown onions was approximately two weeks earlier than the 10 year average and approximately 3 weeks earlier for the red onions. Establishment was good but the season started with a cool spring followed by a mini heatwave and then a warm but wet summer. Spring and summer night time temperatures were higher than average. Mildew was a present in both trials but does not seem to have had a major impact on yield.

Both trials followed local commercial agronomy. Maleic hydrazide should not have been applied to either trial but the Norfolk trial storage data suggests that it may have received some or alternatively something else may have affected the sprouting ability of the bulbs.

Key varieties are discussed below and summarised in Table B. Full data summaries are appended.

Discussion

There is a good range of maturities allowing growers to spread their harvest period. A series of warmer years has the average maturity date shifting to earlier in the year. This may also have been affected by an increased number of earlier maturing varieties coming through into trials and thus shifting the split of early to main crop varieties. Many areas had a wet August which prevented harvesting of already mature crops until September and into October – this would have given over mature varieties a yield advantage.

However, in cooler years, such as 2013, we see the maturity dates shifting later in the year and the opportunities to harvest later maturing varieties can run over into October which can result in bulbs having poorer initiation, being harder to dry with consequently inferior storage.

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 in 2014 – both of the 2017 trials had significant levels of mildew but this came in later in the season and does not seem to have impacted significantly on the trial green plot yields. Plant breeders continue to attempt to breed mildew resistance into commercially viable new varieties. Getting the resistance genes into varieties that have high yields, good quality and good storage potential has proved a challenge, with some success seen in brown varieties but very limited success in the reds.

Establishment was good. Seed beds at both sites had good tilth and the trial seed was drilled into moisture. The growing season started with a cool, dry spring followed by a mini heatwave in May and then a warm but wet summer. Crops matured earlier than usual. Commercial crops were affected by the early dry conditions and suffered with poor establishment where irrigation was not available. There were also weed issues where the dry conditions affected the efficacy of residual herbicides.

Drytan, Hybound, Fasto and Hybing were the earliest maturing brown varieties of the drilled trials. Red Light and Karminka were the earliest of the reds.

The mean of trial yields in Norfolk was 82t/ha browns and 74t/ha reds. The mildew came in late enough in the growing season not to have adversely affected yields. The Essex trial yield means were 98t/ha for browns and 83t/ha for reds. Again the mildew did not severely impact upon the yields. Over the last 4 years the 10 year average of the mean marketable yield has been creeping up by approx. 1 t/ha as better varieties become available and agronomic practices change and improve.

The highest yielding brown varieties were Hyway, Hytech and Hypark. Of the new varieties SVND7772 and SVND7599 performed well but were only grown in the Essex trial. Motion, Hylander, Hybing and Hyfive all had high yields on the Essex site. Red Light and Red Baron were the highest yielding red varieties.

There were a small percentage of bacterial rots and physical defects (splitting) in the harvested material from Essex and this was reflected in the storage results. Fusarium continues to be a major concern in commercial crops and the focus of breeding programmes is to introduce known resistances into commercially viable lines.

SV3557ND, Hypark and Drytan were the best of the brown varieties for having high percentages of single centres. Karminka, 37-222 and Red Tide were the best of the reds for single centres. Hybound, Hyway, SV8528ND and Chico have had high percentages of single centres in 2 of the last 3 years.

Storage assessments in an ambient store were recorded in late-April and late-May/early June 2018. The late cold spells in February and March 2018 delayed sprouting by a few days or maybe even by over a week and this was reflected by shifting the assessment dates to capture the biggest differences between varieties. Cold storage assessments were recorded in July 2018.

Storage potential continues to be a key factor for drilled crops. The long delay between crop maturity and harvest was a concern for growers as there was the potential for diseases to be expressed during storage.

Drytan, Hyway, SVND7772 and Medaillon all performed significantly above average in 2017/18. Drytan, Medaillon, Hyway, and Vision have consistently had above average percentages of sound bulbs at the late-May assessment. Red Tide and 37-111 performed well in the reds. Redspark has performed above average in previous years.

In cold storage the varieties Drytan, Vision, Hyway and Hyfive were the best brown varieties for storage. Red Tide and Retano were the best performing of the red varieties.

Stored bulb quality was generally very good throughout most of the brown varieties but the reds showed more softening.

Conclusions

The yield potential of varieties can vary greatly. In the drilled trials this was approx. 29t/ha between the highest and lowest yield means for brown varieties.

The trials yield data 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.

Drilled Varieties

Varieties need to match the grower's requirements and ideally have two or more above average characteristics e.g. for early maturity and high green plot yields, Hybound and Hypark are suitable choices; for green plot yield and post storage yields Hyway performed well – Medaillon and Vision performed well in previous years. Fasto, Chico and SV3557ND are newer varieties to keep an eye on over the next couple of seasons.

Hybound, Hybing and Drytan are consistently early maturing brown varieties. Red Light is commonly one of the earliest reds.

The highest yielding brown varieties were Hyway, Hypark and Hytech. Red Light and Red Baron were the highest yielding reds. Hytech and Red Light have consistently been amongst the higher yielders.

Drytan, Hyway, SVND7772 and Medaillon all had better than average storage potential in ambient store. Vision and Hyway are normally in this category too. Red Tide and 37-111 performed well in the reds. Redspark has performed above average in previous years.

In cold storage the varieties Drytan, Vision, Hyway and Hyfive were the best brown varieties for storage. Medaillon and Vision are also known for good storage in cold stores. Red Tide and Retano were the best performing of the red varieties – Red Light has performed well previously.

Financial Benefits

The yield potential of varieties can vary greatly. In the drilled trials this was approximately 29t/ha and 21t/ha between the highest and lowest yielding browns and reds respectively (mean of both trials).

Yield out of store is also important. Drilled material showed a difference of over 55% and 60% between the best and worst storage potential from ambient storage in the browns and reds respectively. From cold storage the differences were approximately 70% for browns and reds.

Mildew resistant varieties require fewer and or cheaper fungicide programmes.

Action Points

- Select a range of varieties according to soil type, desired harvest period, habit vigour and disease tolerance
- Select varieties best suited to your storage facilities
- Varieties should match the market and available storage facilities – longer storing varieties give more options
- In high disease pressure years grow material with good disease resistance e.g. mildew resistance – grow a range of varieties and use local knowledge of fields that could be disease hot spots
- Seed cost is a factor in the selection of varieties

Technology transfer

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

Open days and events were also hosted on these occasions:

1. Drilled crop field open day in Norfolk – August 2017
2. Drilled crops harvested produce open day and technical presentations at NIAB, Cambridge – November 2017

These events were well attended by a number of 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.

Trials and onion related updates are regularly featured on social media through twitter @AHDB_Hort @basnapier @NIABTAG @BritishGrowers with a combined following of over 15,000 users. BOPA monthly grower newsletters are also used to circulate key dates and information.

Appendices

Table 1. NIAB Spring Sown Onion Trials from seed 2017 – varieties

Sites: Rix (Essex) and Raker (Norfolk)

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

Variety	Status	Source	Maturity		
			Date of 80% foliage fallover		
			Essex	Norfolk	Mean
BROWNS					
Drytan (BGS298)	3	Bejo/DGS	02-Aug	05-Aug	03-Aug
Hybound (BGS 266)	R	Bejo/DGS	04-Aug	03-Aug	04-Aug
Fasto (37-104)	1	Hazera	04-Aug	06-Aug	05-Aug
Hybing	C	Bejo/DGS	08-Aug	07-Aug	07-Aug
Hysky (BGS 289)	4	Bejo/DGS	08-Aug	10-Aug	09-Aug
Hypark	R	Bejo/DGS	09-Aug	10-Aug	10-Aug
SV3557ND	4	Agility/Seminis	10-Aug	10-Aug	10-Aug
SVND 0363	P (2)	Agility/Seminis	06-Aug	14-Aug	10-Aug
Centro	C	Hazera	11-Aug	11-Aug	11-Aug
Hytech	C	Bejo/DGS	11-Aug	12-Aug	11-Aug
Packito (SV8528ND)	2	Agility/Seminis	10-Aug	13-Aug	11-Aug
Medaillon (ONL353)	R	Syngenta	12-Aug	12-Aug	12-Aug
Vision	C	Syngenta	15-Aug	13-Aug	14-Aug
Bennito	R	Agility/Seminis	14-Aug	14-Aug	14-Aug
Hyway	3	Bejo/DGS	14-Aug	15-Aug	14-Aug
SVND0367	P (2)	Agility/Seminis	14-Aug	-	14-Aug
Hyfive	2	Bejo/DGS	14-Aug	16-Aug	15-Aug
Hylander	4	Bejo/DGS	16-Aug	14-Aug	15-Aug
SVND7772	P	Agility/Seminis	15-Aug	-	15-Aug
SVND7599	P	Agility/Seminis	16-Aug	-	16-Aug
Chico (37-89)	4	Hazera	17-Aug	18-Aug	17-Aug
Bossito (SV1332ND)	2	Agility/Seminis	19-Aug	17-Aug	18-Aug
Santero	R	Hazera	17-Aug	19-Aug	18-Aug
Elista	P	ProVeg	14-Aug	25-Aug	19-Aug
Motion	R	Syngenta	22-Aug	18-Aug	20-Aug
means			12-Aug	13-Aug	12-Aug
REDS					
Karminka	P	ProVeg	28-Jul	01-Aug	30-Jul
Red Light	R	Bejo/DGS	02-Aug	08-Aug	05-Aug
37-222	1	Hazera	05-Aug	09-Aug	07-Aug
Red Tide	C	Bejo/DGS	05-Aug	11-Aug	08-Aug
Retano	R	Hazera	09-Aug	10-Aug	09-Aug
37-111	1	Hazera	08-Aug	11-Aug	10-Aug
Red Herald (ABS212)	2	Allium Seeds	13-Aug	13-Aug	13-Aug
Red Baron (AS)	2	Allium Seeds	12-Aug	15-Aug	13-Aug
Red Baron	C	Bejo/DGS	13-Aug	16-Aug	15-Aug
Redspark	C	Bejo/DGS	16-Aug	14-Aug	15-Aug
means			08-Aug	11-Aug	09-Aug

**Table 2. NIAB Spring Sown Onion Trials from seed 2017-
Population and Yield data**
Sites: Rix (Essex) and Raker (Norfolk)

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

Variety	plant pop. (plants / sq. m)			Bulbs >40mm marketable yield (t/ha)			Bulbs >60mm marketable yield (t/ha)			% bulbs by weight >60mm		
	Rix	Raker	Mean	Rix	Raker	Mean	Rix	Raker	Mean	Rix	Raker	Mean
BROWNS												
Drytan	58.6	48.9	53.7	99.8	88.3	94.0	88.3	82.6	85.5	88.5	93.5	91.0
Hybound	58.8	49.8	54.3	100.2	79.8	90.0	87.6	68.5	77.9	87.4	85.8	86.6
Fasto	47.9	48.6	48.2	93.3	83.7	88.5	88.4	77.3	82.7	94.7	92.3	93.5
Hybing	56.4	48.4	52.4	103.6	89.4	96.5	96.0	83.0	89.5	92.7	92.8	92.7
Hysky	56.5	50.4	53.4	100.0	92.8	96.4	92.9	87.6	90.3	92.9	94.4	93.7
Hypark	57.3	50.5	53.9	104.1	92.4	98.2	94.8	87.1	91.0	91.1	94.3	92.7
SV3557ND	57.1	48.2	52.6	97.1	81.8	89.4	85.1	74.5	79.8	87.6	91.1	89.3
SVND 0363	59.9	49.0	54.4	97.3	79.0	88.1	84.8	67.9	76.3	87.2	86.0	86.6
Centro	48.2	47.7	47.9	94.4	82.1	88.3	90.2	76.2	83.2	95.6	92.8	94.2
Hytech	52.4	51.0	51.7	103.7	93.8	98.8	98.8	87.0	92.9	95.3	92.8	94.0
Packito	59.1	51.3	55.2	97.2	80.3	88.8	84.7	69.3	77.0	87.1	86.3	86.7
Medaillon	46.1	41.1	43.6	92.2	78.2	85.2	87.8	73.0	80.3	95.2	93.3	94.3
Vision	48.2	40.2	44.2	97.5	76.5	87.0	91.2	71.7	81.4	93.5	93.7	93.6
Bennito	58.1	49.4	53.7	93.5	77.3	85.4	80.9	66.2	73.5	86.5	85.7	86.1
Hyway	59.2	47.7	53.4	111.4	88.9	100.1	103.4	81.2	92.2	92.8	91.3	92.1
SVND0367	53.8	-	53.8	88.7	-	88.7	78.0	-	78.0	87.9	-	87.9
Hyfive	57.0	50.0	53.5	106.5	87.7	97.1	97.8	80.1	88.8	91.8	91.3	91.5
Hylander	60.5	51.4	56.0	107.2	87.6	97.4	98.1	76.2	86.9	91.5	87.0	89.2
SVND7772	61.4	-	61.4	98.3	-	98.3	84.0	-	84.0	85.5	-	85.5
SVND7599	58.8	-	58.8	98.4	-	98.4	86.3	-	86.3	87.7	-	87.7
Chico	59.7	50.5	55.1	96.0	76.0	86.0	81.1	62.0	71.4	84.5	81.6	83.0
Bossito	57.3	45.8	51.5	94.4	75.6	85.0	83.0	64.9	73.8	87.9	85.8	86.8
Santero	49.5	48.2	48.9	90.4	76.0	83.2	85.2	67.3	76.0	94.2	88.6	91.4
Elista	78.4	51.8	65.1	77.0	66.1	71.6	21.6	33.0	27.9	28.1	49.9	39.0
Motion	43.6	38.1	40.8	107.0	77.4	92.2	104.9	72.6	88.4	98.0	93.8	95.9
means	56.2	48.1	52.1	98.0	82.3	90.1	86.4	72.8	79.6	88.2	88.4	88.3
REDS												
Karminka	76.0	69.1	72.5	65.5	62.6	64.0	11.7	10.6	11.1	17.9	16.9	17.4
Red Light	45.0	43.3	44.1	99.0	86.2	92.6	96.6	82.3	89.4	97.6	95.5	96.5
37-222	53.7	47.3	50.5	80.1	67.2	73.6	66.1	52.3	59.0	82.5	77.8	80.1
Red Tide	53.0	45.2	49.1	87.2	78.7	83.0	77.3	71.5	74.5	88.6	90.8	89.7
Retano	53.0	46.0	49.5	76.2	68.2	72.2	60.6	55.5	58.0	79.5	81.4	80.4
37-111	47.4	44.2	45.8	79.5	67.3	73.4	70.5	57.6	63.9	88.7	85.6	87.1
Red Herald	57.0	50.7	53.8	83.0	71.5	77.3	68.7	55.1	61.8	82.8	77.0	79.9
Red Baron(AS)	54.3	47.2	50.7	86.0	77.1	81.5	72.4	66.5	69.4	84.2	86.2	85.2
Red Baron	54.0	51.8	52.9	88.2	81.0	84.6	76.0	69.2	72.6	86.2	85.4	85.8
Redspark	49.3	46.3	47.8	85.3	76.3	80.8	78.1	67.7	72.9	91.6	88.7	90.2
means	54.3	49.1	51.7	83.0	73.6	78.3	66.4	57.8	62.0	80.0	78.5	79.2

Table 3. NIAB Spring Sown Onion Trials from seed 2017 - rots by category

Sites: Rix (Essex) and Raker (Norfolk)

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

Variety	% defects (excl. rots)			% Base Rots			% Neck Rots			% bacterial rots			% Penicillium		
	Rix	Rak.	Mean	Rix	Rak.	Mean	Rix	Rak.	Mean	Rix	Rak.	Mean	Rix	Rak.	Mean
BROWNS															
Drytan	0.1	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.1
Hybound	0.2	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.1	0.3	0.0	0.0	0.0
Fasto	0.0	0.8	0.4	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0
Hybing	0.8	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.2	0.5	0.0	0.0	0.0
Hysky	1.2	0.3	0.7	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.1	0.7	0.0	0.0	0.0
Hypark	0.2	0.1	0.2	0.0	0.3	0.2	0.0	0.0	0.0	0.6	0.0	0.3	0.0	0.0	0.0
SV3557ND	0.5	0.2	0.3	0.0	0.1	0.1	0.0	0.0	0.0	0.3	0.0	0.1	0.0	0.0	0.0
SVND 0363	1.9	0.7	1.3	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.6	0.0	0.0	0.0
Centro	1.1	1.8	1.5	0.0	0.3	0.2	0.0	0.0	0.0	0.6	0.0	0.3	0.0	0.0	0.0
Hytech	0.3	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.3	0.3	0.0	0.0	0.0
Packito	1.6	0.6	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.1	0.4	0.0	0.0	0.0
Medaillon	3.8	0.5	2.1	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.5	0.0	0.0	0.0
Vision	1.4	0.3	0.9	0.0	0.2	0.1	0.0	0.0	0.0	1.5	0.8	1.2	0.0	0.0	0.0
Bennito	1.5	0.5	1.0	0.1	0.0	0.1	0.0	0.0	0.0	1.0	0.0	0.5	0.0	0.0	0.0
Hyway	0.0	0.5	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.1	0.0	0.0	0.0
SVND0367	0.2	-	0.2	0.0	-	0.0	0.0	-	0.0	0.8	-	0.8	0.0	-	0.0
Hyfive	0.3	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.1
Hylander	0.7	0.0	0.4	0.3	0.0	0.2	0.0	0.0	0.0	0.2	0.0	0.1	0.0	0.0	0.0
SVND7772	0.5	-	0.5	0.0	-	0.0	0.2	-	0.2	0.0	-	0.0	0.0	-	0.0
SVND7599	0.7	-	0.7	0.0	-	0.0	0.0	-	0.0	0.4	-	0.4	0.0	-	0.0
Chico	0.5	0.3	0.4	0.0	0.1	0.1	0.0	0.0	0.0	0.2	0.0	0.1	0.0	0.0	0.0
Bossito	0.4	0.2	0.3	0.1	0.0	0.1	0.0	0.0	0.0	0.3	0.2	0.2	0.0	0.0	0.0
Santero	0.9	0.3	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.0
Elista	0.4	1.7	1.1	0.0	0.2	0.1	0.0	0.4	0.2	0.4	0.4	0.4	0.0	0.0	0.0
Motion	0.2	0.2	0.2	0.0	0.2	0.1	0.0	0.0	0.0	1.8	0.0	0.9	0.0	0.0	0.0
means	0.8	0.4	0.6	0.0	0.1	0.0	0.0	0.0	0.0	0.6	0.1	0.4	0.0	0.0	0.0
REDS															
Karminka	0.3	0.2	0.3	0.3	0.1	0.2	0.0	0.0	0.0	3.3	0.0	1.6	0.5	0.0	0.3
Red Light	2.4	0.3	1.4	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.2	0.7	0.0	0.0	0.0
37-222	0.8	0.6	0.7	0.0	0.0	0.0	0.0	0.0	0.0	1.6	0.3	1.0	0.0	0.0	0.0
Red Tide	0.5	0.2	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.2	0.6	0.0	0.0	0.0
Retano	0.9	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.0	0.0	0.0
37-111	1.3	0.2	0.7	0.3	0.0	0.2	0.0	0.0	0.0	0.3	0.2	0.2	0.0	0.0	0.0
Red Herald	3.8	0.1	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0
Red Baron(AS)	0.5	0.5	0.5	0.0	0.0	0.0	0.1	0.0	0.1	0.5	0.0	0.3	0.0	0.0	0.0
Red Baron	0.7	0.6	0.7	0.1	0.0	0.1	0.0	0.0	0.0	0.4	0.1	0.3	0.0	0.0	0.0
Redspark	0.9	0.2	0.5	0.0	0.0	0.0	0.2	0.0	0.1	1.2	0.2	0.7	0.0	0.0	0.0
means	1.2	0.3	0.7	0.1	0.0	0.0	0.0	0.0	0.0	1.0	0.1	0.6	0.1	0.0	0.0

Table 4. NIAB Spring Onion Trials from seed 2017 – Bulb Quality data

Sites: Rix (Essex) and Raker (Norfolk)

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

Variety	Bulb Quality (1-9)														
	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															
Drytan	5.5	5.0	5.3	7.0	7.0	7.0	5.0	5.0	5.0	6.5	6.5	6.5	7.5	7.5	7.5
Hybound	4.5	4.5	4.5	7.0	7.0	7.0	5.0	5.0	5.0	6.0	6.5	6.3	7.0	7.0	7.0
Fasto	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
Hybing	4.5	4.5	4.5	7.0	7.0	7.0	5.0	5.5	5.3	6.0	6.0	6.0	7.0	7.0	7.0
Hysky	5.0	5.0	5.0	7.0	7.0	7.0	5.0	5.0	5.0	6.5	7.0	6.8	7.0	7.0	7.0
Hypark	5.0	5.5	5.3	6.5	7.0	6.8	5.0	5.0	5.0	6.5	6.5	6.5	7.0	7.0	7.0
SV3557ND	6.0	5.5	5.8	6.5	7.0	6.8	5.0	5.0	5.0	6.0	6.5	6.3	7.0	7.0	7.0
SVND 0363	5.5	5.5	5.5	7.0	7.0	7.0	5.0	5.0	5.0	6.5	6.0	6.3	7.0	7.0	7.0
Centro	5.5	5.5	5.5	7.0	7.0	7.0	5.0	5.0	5.0	6.5	6.0	6.3	7.0	7.0	7.0
Hytech	5.0	4.5	4.8	6.0	7.0	6.5	5.0	5.0	5.0	5.5	6.0	5.8	7.0	7.0	7.0
Packito	5.0	5.5	5.3	7.0	7.0	7.0	5.0	5.0	5.0	5.5	5.5	5.5	7.0	7.0	7.0
Medaillon	4.5	5.0	4.8	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	6.0	6.0	6.0	7.0	7.0	7.0	5.0	5.0	5.0	5.5	6.0	5.8	6.5	7.0	6.8
Bennito	4.5	5.0	4.8	6.0	7.0	6.5	5.0	5.0	5.0	6.0	6.5	6.3	7.0	7.0	7.0
Hyway	4.5	5.0	4.8	7.0	7.0	7.0	5.0	5.0	5.0	7.0	7.0	7.0	7.0	7.0	7.0
SVND0367	5.0	-	5.0	6.5	-	6.5	4.5	-	4.5	5.0	-	5.0	7.0	-	7.0
Hyfive	4.5	5.0	4.8	6.5	7.0	6.8	5.0	5.0	5.0	7.0	7.0	7.0	7.0	7.0	7.0
Hylander	5.0	4.5	4.8	7.0	7.0	7.0	5.0	5.0	5.0	6.0	6.0	6.0	7.0	7.0	7.0
SVND7772	5.5	-	5.5	6.5	-	6.5	5.0	-	5.0	6.0	-	6.0	7.0	-	7.0
SVND7599	5.0	-	5.0	7.0	-	7.0	5.0	-	5.0	6.0	-	6.0	7.0	-	7.0
Chico	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
Bossito	5.0	6.0	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	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
Elista	5.0	5.0	5.0	7.0	7.0	7.0	8.0	8.0	8.0	5.5	5.0	5.3	6.5	6.5	6.5
Motion	5.0	5.0	5.0	7.0	7.0	7.0	5.0	5.0	5.0	6.5	6.5	6.5	7.0	7.0	7.0
means	5.1	5.2	5.1	6.8	7.0	6.9	5.1	5.2	5.1	6.1	6.3	6.2	7.0	7.0	7.0
REDS															
Karminka	5.0	4.5	4.8	6.5	7.0	6.8	8.0	5.0	6.5	6.0	6.0	6.0	6.0	6.0	6.0
Red Light	6.5	6.0	6.3	6.0	7.0	6.5	5.0	5.0	5.0	5.0	5.5	5.3	6.5	6.5	6.5
37-222	5.0	4.5	4.8	7.0	7.0	7.0	5.0	5.0	5.0	5.5	5.5	5.5	7.0	6.0	6.5
Red Tide	7.0	7.0	7.0	6.0	7.0	6.5	4.5	4.5	4.5	5.5	5.0	5.3	6.5	6.5	6.5
Retano	6.5	6.5	6.5	7.0	7.0	7.0	5.0	5.0	5.0	6.0	7.0	6.5	7.0	7.0	7.0
37-111	5.5	4.5	5.0	7.0	7.0	7.0	5.0	5.0	5.0	5.5	5.0	5.3	6.5	6.0	6.3
Red Herald	5.5	7.0	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
Red Baron(AS)	6.0	6.0	6.0	6.5	7.0	6.8	5.0	5.0	5.0	7.0	6.5	6.8	7.0	6.5	6.8
Red Baron	6.0	6.0	6.0	7.0	7.0	7.0	5.0	5.0	5.0	6.0	6.0	6.0	7.0	7.0	7.0
Redspark	6.0	6.5	6.3	6.5	7.0	6.8	5.0	5.0	5.0	6.0	5.5	5.8	7.0	6.5	6.8
means	5.9	5.9	5.9	6.7	7.0	6.8	5.3	5.0	5.1	5.9	5.9	5.9	6.8	6.5	6.6

Table 5. NIAB Spring Sown Trials from seed 2017 – 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 on a 0-3 scale of severity

	Early vigour 1-9 9=vigorous			Establishment %			Mildew (July) 0-3 3= very severe		
variety	Rix	Raker	Mean	Rix	Raker	Mean	Rix	Raker	Mean
BROWNS									
Drytan	5.7	8.0	6.9	90	>95%	93	1.8	0.7	1.3
Hybound	6.0	8.0	7.0	82	>95%	89	1.2	0.5	0.8
Fasto	6.3	7.3	6.8	90	>95%	93	1.2	1.0	1.1
Hybing	6.3	8.0	7.2	85	>95%	90	1.5	0.5	1.0
Hysky	6.3	7.7	7.0	88	>95%	92	1.5	0.5	1.0
Hypark	5.0	7.7	6.4	83	>95%	89	1.5	0.5	1.0
SV3557ND	6.0	8.0	7.0	88	>95%	92	1.2	0.8	1.0
SVND 0363	6.0	7.0	6.5	95	>95%	95	1.5	1.0	1.3
Centro	5.7	7.3	6.5	88	>95%	92	1.0	0.5	0.8
Hytech	4.7	7.7	6.2	83	>95%	89	1.3	0.5	0.9
Packito	5.3	7.7	6.5	90	>95%	93	1.2	0.8	1.0
Medaillon	4.7	7.3	6.0	80	>95%	88	1.0	0.7	0.8
Vision	4.7	7.0	5.9	82	>95%	89	1.7	0.5	1.1
Bennito	5.0	7.3	6.2	88	>95%	92	1.5	0.7	1.1
Hyway	5.0	7.3	6.2	85	>95%	90	1.3	0.5	0.9
SVND0367	4.5	-	4.5	88	-	88	1.0	-	1.0
Hyfive	5.0	7.0	6.0	87	>95%	91	1.2	0.5	0.8
Hylander	5.3	8.0	6.7	85	>95%	90	1.0	0.5	0.8
SVND7772	5.5	-	5.5	>95%	-	95	1.0	-	1.0
SVND7599	5.5	-	5.5	88	-	88	1.8	-	1.8
Chico	5.3	7.3	6.3	87	>95%	91	1.3	0.8	1.1
Bossito	5.0	7.7	6.4	87	>95%	91	1.0	0.8	0.9
Santero	5.3	7.7	6.5	80	>95%	88	1.2	0.8	1.0
Elista	5.5	6.5	6.0	93	>95%	94	2.8	1.0	1.9
Motion	4.7	7.0	5.9	80	>95%	88	1.0	1.0	1.0
means	5.4	7.5	6.4	87	>95%	91	1.3	0.7	1.0
REDS									
Karminka	6.5	7.5	7.0	90	>95%	93	2.8	1.5	2.1
Red Light	6.0	8.0	7.0	87	>95%	91	1.2	0.7	0.9
37-222	5.7	8.0	6.9	80	>95%	88	2.0	1.7	1.8
Red Tide	8.0	8.0	8.0	90	>95%	93	1.8	1.3	1.6
Retano	5.3	7.7	6.5	85	>95%	90	1.5	1.0	1.3
37-111	5.7	8.0	6.9	82	>95%	89	1.7	1.7	1.7
Red Herald	6.3	8.0	7.2	87	>95%	91	1.5	1.7	1.6
Red Baron(AS)	6.3	8.0	7.2	88	>95%	92	1.7	1.0	1.3
Red Baron	6.7	7.3	7.0	85	>95%	90	1.7	2.0	1.8
Redspark	6.3	7.7	7.0	85	>95%	90	1.7	1.8	1.8
means	6.3	7.8	7.1	86	>95%	90	1.7	1.4	1.6

Table 6. NIAB Spring Sown Onion Trials from seed 2017 - 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			
Drytan	64.4	48.9	56.7
Hybound	44.4	35.6	40.0
Fasto	22.2	66.7	44.4
Hybing	46.7	40.0	43.3
Hysky	46.7	33.3	40.0
Hypark	55.6	48.9	52.2
SV3557ND	66.7	48.9	57.8
SVND 0363	20.0	13.3	16.7
Centro	35.6	42.2	38.9
Hytech	42.2	51.1	46.7
Packito	28.9	13.3	21.1
Medaillon	35.6	24.4	30.0
Vision	22.2	8.9	15.6
Bennito	24.4	26.7	25.6
Hyway	51.1	44.4	47.8
SVND0367	46.7	-	46.7
Hyfive	57.8	35.6	46.7
Hylander	57.8	37.8	47.8
SVND7772	63.3	-	63.3
SVND7599	33.3	-	33.3
Chico	40.0	53.3	46.7
Bossito	48.9	33.3	41.1
Santero	51.1	33.3	42.2
Elista	50.0	16.7	33.3
Motion	15.6	28.9	22.2
means	42.8	35.7	39.3
REDS			
Karminka	73.3	53.3	63.3
Red Light	15.6	20.0	17.8
37-222	91.1	62.2	76.7
Red Tide	62.2	37.7	49.9
Retano	28.9	40.0	34.4
37-111	44.4	31.0	37.7
Red Herald	11.1	15.6	13.3
Red Baron(AS)	28.9	20.0	24.4
Red Baron	35.6	46.7	41.1
Redspark	24.4	20.0	22.2
means	41.6	34.6	38.1

Table 7. NIAB Spring Sown Onion Trials from seed 2017 – Storage data (ambient) Assessments May/Jun 2018

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 cold storage late July
	Rix	Raker	Mean	Rix	Raker	Mean	Rix
BROWNS							
Drytan	98	99	99	80	97	89	68
Hybound	81	99	90	47	96	71	43
Fasto	94	99	96	66	92	79	28
Hybing	83	98	91	37	78	57	22
Hysky	94	97	96	60	92	76	42
Hypark	85	97	91	48	87	67	24
SV3557ND	75	98	87	45	90	68	30
SVND 0363	77	98	87	36	91	64	25
Centro	82	97	90	43	89	66	26
Hytech	80	98	89	41	95	68	45
Packito	82	95	88	50	87	68	19
Medaillon	92	99	96	70	91	81	50
Vision	91	99	95	62	92	77	73
Bennito	62	97	80	25	85	55	18
Hyway	92	99	95	74	96	85	72
SVND0367	83	-	83	67	-	67	50
Hyfive	86	100	93	52	99	76	63
Hylander	86	99	92	52	97	75	48
SVND7772	93	-	93	72	-	72	47
SVND7599	69	-	69	38	-	38	19
Chico	85	98	92	59	95	77	51
Bossito	87	98	92	51	91	71	39
Santero	80	99	89	31	96	63	21
Elista	79	96	87	47	69	58	36
Motion	92	98	95	66	96	81	47
means	84	98	91	53	91	72	40
REDS							
Karminka	34	90	62	12	42	27	19
Red Light	34	92	63	7	58	32	28
37-222	91	96	93	40	89	65	12
Red Tide	95	100	97	75	94	84	48
Retano	85	97	91	56	85	70	50
37-111	94	99	97	59	76	67	33
Red Herald	89	99	94	56	85	71	44
Red Baron(AS)	87	95	91	48	82	65	41
Red Baron	87	98	92	50	87	69	31
Redspark	79	96	88	46	92	69	28
means	78	96	87	45	79	62	34

Table 8. NIAB Spring Sown Onion Trials from seed 2017 – Storage data (ambient) Assessments May 2018 (cold store late July 2018)

Sites: Rix (Essex) and Raker (Norfolk)

Varieties in maturity order (mean of both sites)

Preliminary varieties 2 replicates of data

Variety	firmness (1-9) 1=soft Late April			Total % rots Late May		
	Rix	Raker	Cold store	Rix	Raker	Cold store
BROWNS						
Drytan	6.7	7.3	6.0	6	3	6
Hybound	6.5	7.0	6.5	9	3	4
Fasto	7.0	7.3	5.5	6	7	6
Hybing	6.7	7.0	5.8	5	22	9
Hysky	6.7	7.0	6.3	10	8	8
Hypark	7.0	6.7	6.5	7	13	7
SV3557ND	6.0	7.3	6.5	8	9	4
SVND 0363	7.0	7.0	5.8	8	8	5
Centro	6.7	7.0	5.5	5	11	2
Hytech	7.0	6.7	5.8	7	5	4
Packito	7.0	7.3	6.5	6	11	5
Medaillon	6.7	7.0	5.3	3	9	4
Vision	7.0	7.0	6.5	6	8	6
Bennito	7.0	6.3	5.8	7	14	12
Hyway	7.0	6.7	5.3	2	4	2
SVND0367	7.0	-	5.8	11	-	27
Hyfive	6.7	7.3	6.0	1	1	2
Hylander	6.3	7.0	6.0	2	3	10
SVND7772	6.5	-	6.0	12	-	26
SVND7599	6.0	-	5.0	6	-	6
Chico	6.3	6.7	4.5	9	5	34
Bossito	6.7	7.7	5.8	7	8	10
Santero	6.3	7.0	6.3	3	4	2
Elista	6.0	6.0	5.8	16	31	10
Motion	6.3	8.0	6.0	5	4	15
means	6.6	7.0	5.9	7	9	9
REDS						
Karminka	5.5	5.5	5.8	43	58	4
Red Light	5.3	5.7	4.3	27	42	8
37-222	5.7	6.3	7.0	4	8	2
Red Tide	6.0	7.0	6.0	9	6	4
Retano	6.3	6.0	5.8	10	14	2
37-111	6.0	6.7	5.8	6	24	4
Red Herald	5.7	6.7	5.0	11	14	13
Red Baron(AS)	5.3	6.3	4.8	6	16	6
Red Baron	6.0	6.3	5.5	13	13	10
Redspark	5.7	6.0	5.5	22	6	2
means	5.8	6.3	5.5	15	20	5