SUGAR CANE

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SMUT & SUGAR CANE VARIETIES IN JAMAICA

by Uriel Green

Uriel Green

Sugar cane smut disease, caused by the fungus *Ustillago scitaminea*, is again a cause for concern, especially among growers cultivating the varieties BJ8532, J9501, BJ8534 and BJ82156. Reports and observations indicate that the level of infection is widely variable across the industry.

Smut first entered Jamaica in the 1970's and was essentially brought under control by the early 1980's by the rapid replacement of susceptible HJ5741 and B49119 by resistant varieties. Though never completely eliminated, smut levels remained low and stable for the next two decades. Recently there has been a resurgence of smut in varieties previously resistant.

The early recognition of this resurgence provides for timely corrective measures as the currently affected varieties occupy relatively small acreages: BJ8532 (1%), J9501 (1%), BJ8534 (0.5%) and BJ82156 (2%).

In the case of BJ8532, rated resistant in formal screening trials, this variety showed no smut susceptibility in commercial cultivation for over a decade. However, for the last three years it has become so smut susceptible it is now recommended that propagation should cease and growers are advised to replant infected fields to resistant varieties once expression of the disease exceeds 5% of stools. (BJ8532 was also sent via the Breeding Station to Sudan, tested there, received a "resistant" rating and was cultivated successfully and extended for 9 years before suddenly proving to be extremely susceptible).

Jamaica follows the International Society of Sugar Cane Technologists' (ISSCT) recommended method of variety testing against smut. Test varieties and standards of known susceptibility are treated by inoculation in a slurry of spores and grown alongside each other in plots under observation for the appearance of smut for six months initially, then cut back and observed for a further six months. Varieties are then ranked relative to others with well known reactions to smut.

Hence it was quite odd that in a recent smut trial the known susceptible varieties (HJ5741, BJ7230, and BJ7013) received scores that would rank them as "resistant." A review of trials conducted in the mid 1980's revealed that this was not the first such occurrence and raised again the possibility of the emergence of a new race of smut.

At least six races of smut have been documented worldwide. A study conducted in Jamaica during the late 1980's indi-

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Fig. 1: The growing point of the sugar cane stalk transformed into whip-like structure which generates and releases millions of spores that infect susceptible varieties

CANEFLY AND RAPID SUGAR CANE EXPANSION

by Trevor Falloon

Trevor Falloon

The last record of canefly spraying in Jamaica was in 2004 when less than 500 ha were sprayed at St Jago, Clarendon. Between then and now (2008) there have been only minor flare-ups not requiring spraying at Caymanas and New Yarmouth. These flare-ups were brought under control by natural factors.

This is a far cry from experiences of the 1950s and 1960s when the industry was spraying almost 5 000 hectares (ha) each year, reaching a peak in 1967 when over 18 000 ha were sprayed. In fact, but for a period between 1991-93 when severe outbreaks gripped Holland, the industry has not sprayed much more than 500 ha in any single year for some three decades. The canefly, once regarded as "the scourge of the industry," may therefore now be considered to be essentially under control.

However, there is no room for complacency. If mistakes of the past are repeated, the canefly could once again rise up to plague cane growers. With the prospect of intensified cane farming looming with new investment, the industry could easily slip into another phase of combatting the dreaded pest at considerable expense and with the undesirable increased use of chemicals.

DESCRIPTION

Canefly, a sap-sucking insect, lives on the underside of leaves and within curled spindle leaves of younger canes. In severe outbreaks there may be hundreds of individuals on a single plant. A life cycle starts with adults laying eggs typically along the midrib on the underside of the leaf. Eggs are inserted withing the leaf and covered with a white waxy substance which gives protection against chemicals and most natural enemies. Within 2-3 weeks the eggs hatch and emerging nymphs proceed to feed on the same plant until the adult stage is reached after 5 moults. As the interval between moults is just under a week, a life cycle is usually completed within 6-8 weeks. The full grown adult, capable of mating, is greenish in colour, a mere 0.5 cm long, has two pairs of wings and is the stage at which the canefly spreads to adjacent fields.

POTENTIAL TROUBLE

Failure to follow established principles in canefly control can lead to major complications. A past experience illustrates the point. A fairly large farm had been out of cane production for a number of years. In efforts to get back up to full production in the shortest possible time, the farm embarked on continuous cane planting for nearly three consecutive years. By the end of the second year a canefly outbreak developed on the sudden bonanza of unending supply of young succulent sprouts.

Initial attempts at control did not follow the tried and proven methods and were largely ineffective. The new management, with no previous experience with the canefly or indeed sugar cane, used approaches that had proved successful with pests in other crops. Despite non-stop efforts at control, outbreaks grew successively bigger. Control which would normally be achieved by a single carefully timed spray application, became almost part of a daily routine. In two years the farm carried out over 30 spray applications, four of which were fairly extensive spraying by aircraft. Cumulative area sprayed grew to more than twice total cane area and yet the problem persisted.

Constant bombardment with chemicals caused a depletion in the population of natural enemies (predators and parasites of insects) on the farm. Consequently, one of the worst cases of secondary pest outbreaks ever witnessed then developed as both the grey and yellow aphids took over, leaving fields with yellowing and dying foliage and a generally impoverished look. It was not until recommended practices were followed that the outbreaks were finally brought under control.

YEAR-ROUND REPLANTING

The above experience demonstrates the danger of year-round replanting. Today, the new investors and associated private farmers should of necessity be embarking on a massive replanting programme. This has the potential to fuel a resurgence of canefly problems for three main reasons:

- A massive replanting programme leads to provision of sprouts for extended periods. As noted, canefly thrives on young sprouts. Hardier maturing cane leaves tend to suppress canefly population growth.
- There may be a need to do fall planting. Young sprouts in the fall provide ideal conditions for sustained canefly buildup and, more importantly, allows transfer of populations from sprouts in one season to sprouts at the start of the next in Dec-Jan.
- Heavy fertilization to boost cane yield also favours an increase in the number of canefly offspring produced per female thus speeding population build-up.

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cated that inoculation of the same varieties with smut spores from the southern Irrigated zone generated approximately 33 per cent more whips than spores from the Wet West zone. Meanwhile, Mauritius was also having a similar experience. Such a phenomenon was also noted in Hawaii where a variety rated resistant from the time of the disease entry in 1971 suddenly became widely infected in 1976. Then in 2001 another variety completely resistant to smut from one island was found to be quite susceptible to smut from a neighbouring island. At the same time, researchers in Australia failed to distinguish differences in DNA between various possible smut strains from across the world (though this does not necessarily mean there are no genetic differences).

Fig. 2: J9501, variety of great potential now showing smut in some areas of the industry

Fig. 3: Stool of susceptible variety showing many smut whips and reduced to grassy shoots

It is within this context that SIRI routinely tests varieties before release to the grower. Given recent developments where varieties ranked resistant are now displaying susceptibility, a programme to retest all recently released varieties is underway.

Usually, more smut whips appear when there is environmental stress. Thus drought typically causes larger numbers of whips to appear. Some varieties which are successfully grown in the wetter inland areas of Jamaica succumb immediately to smut if grown on the drier southern Clarendon and St Catherine plains. No record has been found indicating whether hurricane-induced stress could be a factor. It may be only coincidence that the disease could be associated with the extraordinary period of hurricanes affecting the island in recent years. A Florida Sugar Industry study shows that hot, dry, weather is most favourable for spore dispersal. Subsequent wet conditions promote spore germination and, consequently, variety infection. A heavily infected field can also bring sufficient pressure on neighbouring varieties causing them to succumb to the disease although under normal circumstances they would have been resistant.

RECOMMENDATIONS

Growers are advised as follows:

» Roguing to remove diseased stools is not recommended except where whip counts are below 5% (600 stools per hectare) or in small fields or nurseries. Roguing becomes uneconomic over large areas.

» Replant heavily infected fields using seed cane of resistant varieties taken from properly smut-rogued nurseries.

» Allow older infected canes to proceed to harvest.

» Prior to replanting, destroy infected sprouts by spraying with glyphosate (1 litre per 100 litres of water). Allow a few weeks for chemical to take effect then fully destroy by ploughing.

» After ploughing, irrigate where possible or await rainfall to induce germination of spores in the soil. (Heavily infected fields may leave in the soil high spore loads that may overcome resistance in some varieties).

» Complete final preparation and planting with resistant variety

RECOMMENDED VARIETIES

Replanting with a resistant variety is the most cost effective means of smut control. Growers may choose among varieties depending on soil type and moisture regime as listed below:

1) BJ7504

2) BJ7938

3) BJ82119

4) BJ82102

5) BJ82105

6) BJ8783

7) BJ7465

8) BJ7627

9) BJ7314

10) BJ78100

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AVOIDING THE PROBLEM

The best way of avoiding the problem is to concentrate replanting as much as possible to the spring period. With all fields maturing towards the end of the year the cane itself will apply the brakes to canefly build-up. There are other benefits of course to avoiding fall planting such as escaping possible setbacks from flooding on young sprouts during the Sept-Oct rainy season.

DEALING WITH THE PROBLEM

Should fall planting become inescapable then such sites should be carefully monitored. Early detection may allow control before a canefly outbreak gets out of hand. Although the build-up is facilitated by young sprouts in the fall, it may however go undetected until there is an abundance of sprouts in Feb-May at which time the first approach should be to just monitor the population to determine fields infested, stage of development (eggs, nymphs or adults), and level of outbreak (light, medium or heavy). Often outbreaks dwindle under the pressure of natural enemies while monitoring is in progress. The following considerations should be taken into account in assessing whether to spray:

Size of Outbreak: As a rule of thumb, no spraying should be attempted until at least 100 ha are infested. There are over 50 known species of insects, lizards, birds, fungi etc that prey on or parasitise a canefly outbreak. Under the pressure of these natural enemies smaller infestations often disappear on their own.

One aim is to avoid the disruptive effect of insecticides on this host/natural enemy relationship. An insecticide application kills not only the canefly but also many of these natural enemies. Caneflies that survive a spraying often enjoy a population explosion because of the reduction in natural enemies.

The 100 ha minimum is also to allow economic justification of aerial spraying. (At current high fuel costs that minimum should probably be now increased to at least 150 ha). With aerial application infestations that are in taller canes are more easily accessible.

Boom sprayer and pneumatic knapsack applications are to be avoided. A mist blower may be used to clean up zones, such as near high tension wires or against mountains or other danger zones inaccessible to aircraft. Because the canefly is located on the underside of leaves a small droplet size which is made to swirl within the canopy is necessary for effective control.

Stage of Development: A major key to effective canefly control is to avoid spraying the egg stage. Canefly populations are usually conveniently synchronised so that the majority are in either egg, nymph or adult stage. Timing is aimed at spraying when all eggs have hatched - which usually means when the nymphs are just beginning to turn adults. (Adults are usually not capable of producing offspring for the first 11 days).

Level of Outbreak: Canefly infestations may be classified as light, medium or heavy based on the quantity of sooty mould on leaves. Sooty mould is a black fungus which grows in the sap passed out on to the upper leaf surfaces by the canefly.

In a light infestation a quick look will indicate that there are some caneflies but not enough to allow easy sooty mould detection. A medium infestation comprises obvious sooty mould on some patches of cane within a field. With a heavy infestation, virtually every plant within a field is covered with sooty mould.

WHEN TO SPRAY

The decision to spray is triggered only when there are heavy infestations. However at that time all medium and light infestations in the vicinity should also be sprayed.

Cane Age: Since the canefly thrives in young sprouts, if an infestation is detected only in maturing cane action may be withheld, unless this is in the vicinity of a large expanse of young sprouts.

RECOMMENDED INSECTICIDES

Malathion at 1.4 L/ha and fenitrothion at 0.77 L/ha still remain the most effective insecticides used in canefly control. Properly applied, control is total within 1-3 days.

Canefly nymphs mixing with aphids – another sap sucking insect – on the same leaf

Canefly adults – egg laying stage

Heavy outbreak of canefly resulting in growth of black soot mould on leaves

THE IPM APPROACH

What has been described is the Integrated Pest Management (IPM) approach to control where insecticide application is the last resort. Note that the first emphasis is on avoidance - avoid fall planting. The next plank is to wait until natural enemies are given a chance to work (while the infestation expands to at least 100 ha). The third is to exploit cane age when the opportunity presents itself. Only if all else fails should the grower then resort to the use of insecticides.

SUMMARY

The canefly is not now a problem but may become so, should well established principles be breached. The approaching expansionary phase of cane production presents the potential for a resurgence of canefly outbreaks. However, with awareness and attention to proper procedures the industry should continue to enjoy problem-free production. ✸

COPING WITH HIGH FERTILIZER PRICES

by Clarence G. Fearon

Clarence G. Fearon

Cane growers, like other farmers, are bewildered by the unprecedented high cost of fertilizer. In just over a year between 2006 and 2008 fertilizers have skyrocketed by some 150% to more than 250% leaving growers frustrated and unsure of what strategies to use to cope with these massive increases.

To the grower faced with this challenge it is hardly comforting to say that the steep increases are a consequence of high oil prices or increased demand for fertilizer by the international bio-fuels sector. The worrying reality is that there is no immediate sign that prices may fall to more affordable levels. Under these circumstances, should the grower cut back on fertilizer usage? If so, by how much?

This article looks at this issue by placing the cost of typical fertilizer dosages against the value of yields obtained and examines the likely consequences of reducing the dosage. Throughout the exercise, it is assumed that the grower will maintain other field practices – weed control, drainage, irrigation etc – at necessary levels to get the most out of fertilizing.

Is Cutting Back Wise?

Let us assume a typical fertilizer recommendation of 12 bags per hectare of 17-0-17 on ratoon fields. Assume also that fertilizer is applied under conditions that would result in say 90 tonnes cane per hectare (tc/ha). Field trials tell us that if the farmer cuts back and applies only 9 bags per hectare, his yields would drop by roughly 10 tc/ha to some 80 tc/ha, *Table 1*.

Table 1: Expected yield and related costs from varying dosages of 17-0-17 (2008 prices)

Bags 17-0-17	Cane Yield (tc/ha)	Fertilizing Cost ($)
12	90	41 040
9	80	30 780
6	70	20 520

It may make sense to cut back if the cost of purchasing and applying 3 bags of 17-0-17 is more than the value of the 10 tc/ha lost. Take into account also that by cutting back in this way, the farmer saves the cost of harvesting 10 tonnes of cane (at say $750/t). Tallying the savings against potential earnings, the outcome would be as follows:

Savings - cutting back by 3 bags

Purchasing and applying
3 bags 17-0-17 = $10 260
Harvesting 10 tonnes cane
@ $750/t = $7 500
Total Savings = $17 760

Potential Earnings Lost

10 tonnes cane/ha
@ $2 400/t = $24 000
Potential earnings lost
per hectare = ($24 000 – 17 760)
= $6 240

Therefore at existing cane and fertilizer prices the grower would be giving up approximately $6,240/ha of potential earnings by reducing fertilizer from 12 to 9 bags per ha.

What If Cane Price Drops?

The above calculations were done using typical cane prices in the Wet West in 2008. Now if cane prices fall as is expected with planned changes in the European sugar price regime the picture could change. It would be useful therefore to examine fertilizer strategy in the face of lower cane prices. For convenience, we will look at reducing cane price by 10, 20 or 30% from the 2008 levels while keeping fertilizer prices at existing levels, *Table 2*.

Table 2: Value of 10 t cane at varying prices below 2008 levels

Current Cane Price/t J$	% Price Drop	Adjusted Cane price/t ($)	Value of 10 tonnes cane $
2 400	0	2 400	24 000
2 400	10	2 160	21 600
2 400	20	1 920	19 200
2 400	30	1 680	16 800

As shown earlier, the grower would be saving some $17,760 per hectare in fertilizing cost if he cuts back by 3 bags of 17-0-17. Should cane price drop by 30%, the savings would be more than the value of the cane lost ($16,800) and the farmer would clearly be justified in reducing fertilizer dosage. As we know however, fertilizer prices fluctuate and may not necessarily remain at the same high levels. Should they fall proportionately to the fall in cane price then there would be no need to vary dosage.

Phosphate Fertilizers

Once phosphorus is included, fertilizer prices tend to become higher. In the previous example we looked at 17-0-17 which contains no phosphorus. Let us now examine a popular fertilizer containing phosphorus, 16-9-18, frequently used in the industry.

Savings

Purchasing and applying
3 bags 16-9-18 = $13,530
Harvesting 10 tonnes cane
@ $750/t = $7,500
Total Savings = $21,030

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Coping with High Fertilizer Prices contd...

If we assume a similar drop in yield of 10 tc/ha from applying 3 bags less 16-9-18 and a reduction in earnings of $24,000/ha then the potential loss in earnings is just $2,970/ha (that is $24,000-21,030). Here the savings from not applying 3 bags of fertilizer are much closer to the value of the cane yield sacrificed – but still the farmer would be better off applying the recommended dosage.

10% Cane Price Reduction

However, should cane price fall by just 10% (making the value of 10 tonnes cane = $21,600) he would just about break even if he reduces 16-9-18 use from 12 to 9 bags/ha. Simply put any further reduction in cane price would mean that the last three bags of fertilizer would cost more than the extra cane would be worth. The farmer could therefore justify cutting back by three bags per hectare.

Recommendations

Fortunately, in 2008 cane prices were high enough to justify use of recommended dosages. In the event of movements in either or both cane or fertilizer prices another evaluation will be required. Meanwhile farmers are urged to continue use of recommended dosages to maximize returns.

Other Important Guidelines

Current high fertilizer costs call for careful management starting with selection of correct blends and proper application methods. Precision in application is essential to ensure that fertilizer loss is minimized. At planting, blends containing phosphorus such as 14-28-14 and di-ammonium phosphate, where recommended, should be buried with seed pieces as phosphorus tends to be retained in the rooting zone facilitating greater uptake. Fertilizer applied to ratoons should be banded along the banks where it is readily available to the crop.

Soil and Leaf Sampling

Soil and leaf sampling should be maintained as fertilizer prices soar. This will enable precision in correcting deficiencies while avoiding over supply of nutrients.

Farm Manures

Some growers have access to organic sources of fertilizer such as chicken manure, with particularly high nitrogen content, and to a lesser extent other pen manures which are recommended for application to fields. Farm manures are not sufficiently available to supply the fertilizer needs of the entire industry. However there are also quantities of filter cake with high phosphorus, distillers waste with high potassium as well as boiler ash containing high potassium contents, produced at local sugar mills which may be used as supplements to inorganic fertilizers, *Table 3*.

Table 3: Average nutrient contents of some manures

Manures	% Nitrogen	% Phosphate	% Potash
Fresh Filter Cake	1.41	2.81	0.35
Composted Filter Cake	1.15	6.00	0.65
Composted filter cake + 5% Bagasse	1.16	5.10	0.62
Boiler Ash	0.09	0.65	1.50
Poultry Manure	3.00	2.10	2.60

Table 4: Varied combinations of manures and inorganic fertilizers for adequate nutrition

Crop Cycle	Combinations of manures and inorganic fertilizers
Plants	A. 7-8 t/ha Composted filter cake + 8 bags/ha 17-0-20
	B. 7-8 t/ha poultry manure + 6 bags/ha 16-9-18
	C. 7-8 t/ha fresh Ash + 9 bags/ha 16-9-18
Ratoons	A.7-8 t/ha Composted filter cake 8-9 bags/ha 17-0-20
	B. 7-8 t/ha poultry manure + 7 bags/ha 16-9-18
	C. 7-8 t/ha fresh Ash + 10 bags/ha 16-9-18

Composted factory wastes such as filter cake and bagasse offer greater advantages than fresh material because of reduced bulk and therefore reduced transportation cost, greater ease of applying and higher nutrient availability.

Where estates may not be able to immediately embark on a composting programme, piles of filter cake and boiler ash can be made in an open space and turned twice weekly with a front–end loader while attempting to achieve 50% moisture in the piles. By so doing, a partially broken down factory waste which allows easier application may be produced in 4 weeks. Growers are encouraged to apply combinations of inorganic fertilizer and manures as suggested in *Table 4* where these may result in savings.

Summary

In summary, the fertilizer crisis has presented extra financial burden on farmers already short of cash. However, so long as cane price remains at or near current levels it still makes economic sense to apply recommended dosages. To do otherwise will only result in lower yields and profits and lead to farmers getting out of business. Full use should be made of supplements such as farm manures which have the added effect of improving soil structure and fertility✸

Smut & Sugar Cane Varieties in Jamaica *contd...*

It is important to establish pure-stand fields of resistant varieties and maintain these by supplying only with the same varieties. This facilitates correct assessment of variety performance not only from a disease susceptibility standpoint but also with regard to productivity.

In summary, the current smut resurgence is far less challenging than the initial appearance of smut in the 1970s when Jamaica then had over 40% of area under susceptible varieties. Since then the industry has followed a policy of not having more than 30% of acreage in a single variety. Affected varieties now occupy less than 2% of area in cane✸

Variety Recommendations for Harvesting Periods & Soil Types

Cane-growing Area	Harvesting Period	Light Soils	Clay Loams	Clays
Westmoreland & Hanover	Early	BJ7555	BJ7452	BJ7465
		BJ7465	BJ7015	BJ7452
		BJ7015	BJ7555	BJ8252
		BJ7314		BJ7555
				BJ7015
	Middle	BJ7504	BJ7555	BJ7627
		BJ7015	BJ7627	BJ7504
		BJ7555	BJ7015	BJ7015
			BJ7938	BJ7938
			BJ82119	BJ82119
	Late	BJ7938	BJ7938	BJ7938
		BJ7627	BJ7627	BJ82119
			BJ82119	BJ7627
Irrigated Clarendon & St. Catherine Plain	Early	BJ7465	BJ7015	BJ7465
		BJ7015	BJ7555	BJ8252
		BJ7555	BJ7627	BJ7555
		BJ7938	BJ82102	BJ82119
		BJ82102	BJ7465	BJ82102
		BJ7627	BJ8252	BJ8252
		BJ7262		UCW5465
				BJ7015
	Middle	BJ82119	BJ82119	BJ7504
		BJ7548	BJ7548	BJ7627
		BJ82102	BJ82102	BJ7548
		BJ7555	BJ7555	BJ82102
		BJ78100	B78100	BJ7555
			BJ8252	BJ8252
	Late	BJ7938	BJ7938	BJ7938
		BJ7627	BJ7627	BJ7627
Upper St. Catherine & Upper Clarendon	Early	BJ7555	BJ7555	BJ7555
		BJ7015	BJ7015	BJ7465
		BJ7465	BJ82156	BJ7015
		BJ7314	BJ7314	BJ7314
		BJ82156	BJ7627	BJ7627
		BJ7627	BJ7504	BJ7504
	Middle	BJ7555	BJ7555	BJ7555
		BJ7465	BJ7015	BJ7462
		BJ82119	BJ82119	BJ82119
		BJ7262	BJ7262	BJ82156
		BJ82156	BJ82156	
	Late	BJ7938	BJ7938	BJ7938
		BJ7627	BJ7627	BJ7627

Cane-growing Area	Harvesting Period	Light Soils	Clay Loams	Clays
St Thomas	Early	N/A	BJ7314	BJ7465
			BJ7555	BJ7555
			BJ7452	BJ7452
			BJ82156	BJ7627
			BJ7627	BJ7015
	Middle	BJ7555	BJ7627	BJ7627
		BJ82119	BJ7555	BJ7555
		BJ8207	BJ82119	BJ8207
		BJ82156	BJ7627	BJ7015
				BJ82119
	Late	BJ7627	BJ7627	BJ7627
		BJ82119	BJ82119	BJ82119
Trelawny St. James & St. Ann	Early	BJ7465	BJ82156	BJ7465
		BJ82119	BJ7015	BJ82156
		BJ82156	BJ7504	BJ7504
		BJ7504	BJ7465	BJ7465
		BJ7465	BJ8252	
		BJ8252	BJ82102	
	Middle	BJ82119	BJ7627	BJ7627
		BJ7504	BJ82156	BJ7504
		BJ82156	BJ82119	BJ82156
				BJ7015
	Late	BJ7627	BJ7627	BJ7627
				BJ7015
St. Elizabeth	Early	BJ7015	BJ7015	BJ7015
		BJ7314	BJ82102	BJ82102
		BJ82102	BJ7465	BJ7465
		BJ7938	BJ7938	BJ7938
		BJ7555		
	Middle	BJ7252	BJ7627	BJ7627
		BJ82119	BJ7465	BJ7465
		BJ82102	BJ8252	BJ7938
		BJ7465		BJ8252
		BJ8252		
		BJ7627		
		BJ82156		
	Late	BJ7465	BJ7627	BJ7465
		BJ7627	BJ7465	BJ7627
		BJ7314	BJ7314	BJ7314

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