What's Cropping Up?

A NEWSLETTER FOR NEW YORK FIELD CROPS & SOILS VOLUME 2, NUMBER 5, 1992

Corn Harvest - Safety Considerations

John G. Pollock
Exec. Director, NYS Rural Health & Safety Council, Inc.

The corn harvest is upon us in one form or another. The unusual growing conditions of this season have put added stress upon growers which means that workers will be at added risk of injury particularly if the weather conditions are unfavorable during harvest time. Here are some safety considerations that farm workers should be aware of as corn harvest commences.

Silo Filler's Disease

Complex chemical reactions involved in the formation of silage give off lethal nitrogen gases and carbon dioxide. The nitrogen gases (predominately nitrogen dioxide) present the greatest threat in and around upright silos. **You must avoid breathing silo gas.** No one ever should enter an oxygen-limiting silo because there never is enough air to support life.

Silo gas has a disagreeable odor which has been described by some as bleach-like. How disagreeable the gas smells will depend on the concentration of the gas. Staying in the gas will seem okay because you lose the ability to smell. You may be overcome in the silo or several hours may pass before serious respiratory problems occur.

Silo gas is heavier than air so it will settle to the lowest area. It will settle on top of the silage or drain down into the silo room through an open silo door. In the silo room or barn, it becomes a hazard to both man and beast. The color of silo gas may range from red through orange to dark brown provided the concentration is high enough. In poor lighting you may not see the gas at all.

Eliminating silo gas is virtually impossible. Fortunately there are ways to handle the situation safely by following a few precautions. Stay out of the silo for at least two weeks after filling if at all possible. If you must enter to level out the silage, do it immediately after filling and leave the blower running while you are there. Keep the doors between the silo room and the main barn closed, but open windows and exterior doors of the silo room to allow fresh air to enter. If you experience any coughing or throat irritation in the silo, **get out immediately and seek medical attention.**

If a person becomes disabled in the silo and you suspect silo gas—**do not enter the silo**—call emergency medical and rescue personnel at once. After the call, return to the silo and start the blower if it is still at the silo.

Harvest Equipment

Plugged intake of the chopper or picker is the predominate equipment concern during corn harvest. When the equipment has plugged for the tenth time that day it becomes easier to fail to shut the machine down. Leaving the machine running and pulling on the stalks may result in clearing the plug quicker but most of you have personal knowledge of someone who was severely injured or killed in a corn harvest head.

A second area of concern in a corn chopper is a plugged throat in the discharge chute. Knives mounted on a heavy flywheel may continue to rotate for a considerable period of time after the PTO is disengaged. Reaching into that area without allowing sufficient time for the chopping knives to stop rotating can result in the loss of fingers or a hand.

The simple task of hooking up wagons behind a chopper or picker may not appear to be dangerous but injuries to hands and legs can occur to the person assisting in this task if signals are misunderstood by the tractor operator. Agriculture has a set of hand signal standards and it is recommended that all farm workers learn and use them. It is imperative that whatever signals are used that they be recognized and understood by everyone involved in the job. Copies of the hand signals are available upon request.

For more information on these subjects, contact the author at 334 Riley Robb Hall, Cornell University, Ithaca, NY 14853 or call (607 255-3186.

DISEASE MANAGEMENT

Scab or Fusarium Head Blight in Wheat

Gary C. Bergstrom
Plant Pathology

Following harvest of the weather-ravaged winter wheat crop in 1992, many growers and grain buyers raised questions about factors that reduced grain quality. While the overwhelming factor was premature sprouting due to excessive moisture after the grain had matured, there were also many questions about a disease called scab (or Fusarium head blight), caused by *Fusarium* molds. Scab affects barley and oats as well but is especially damaging to wheat. Scab occurs to some extent each year in New York and severe epidemics occur once in every several years (most recently 1986 and 1989).

The Disease

Scab is first observed as a premature bleaching or ripening of individual spikelets or portions of spikes. The entire spike above the point of infection may be bleached. A brown discoloration can also progress onto the stem below an infected spike. A characteristic pink to orange mold can often be detected at the base of infected spikelets during humid weather. Spikelets infected shortly after flowering produce no grain. Spikelets infected somewhat later produce scabby seeds that show various degrees of shriveling and pink discoloration. Severely infected spikelets produce lightweight, chalky-white kernels, known in the grain trade as 'tombstones' that are often removed by a combine with a properly adjusted fan. Scab can significantly reduce yield and marketability of grain. Scabby grain may be contaminated with mycotoxins, especially deoxynivalenol (DON or vomitoxin) which can produce digestive problems in humans and animals with simple stomachs such as swine. Dairy cattle and poultry appear to be insensitive to low levels of DON. USDA guidelines limit DON contamination to 1 part per million (ppm) in wheat food products and 2 ppm in unmilled wheat. Agriculture Canada guidelines prescribe animal diets containing less than 1 ppm DON or no mycotoxins for pregnant or lactating animals. Scabby grain also has reduced value as seed. Infected seed may fail to germinate or may give rise to blighted seedlings if sown in warm, dry soil. On the other hand, I have observed lightly infected seed perform very well when planted in September in New York.

Epidemic Development

Wheat spikes are susceptible to infection primarily during a brief period following flowering. [Note: Later season infection can occur when spikes lie on the ground after plants lodge as in 1992; it is inadvisable to harvest badly lodged wheat]. Severe scab occurs in years and locations where extended wet, humid weather coincides with crop flowering in late May to early June. Infection is favored by at least 24 hours of surface wetness and temperatures between 68 and 86 degrees. In New York, scab is caused primarily by *Fusarium graminearum*, the principal causal fungus of corn stalk rot and red ear mold. Corn crop residues, and to a much lesser extent wheat and other cereal and grass residues, on the soil surface are the source of spores that infect wheat spikes. Asexual spores produced on debris that has overwintered on the soil for one year are splashed by rain onto nearby wheat spikes. Therefore, wheat sown directly into corn stubble is especially at risk of infection. However, sexual spores produced on corn stubble that has overwintered for up to 2 years can be blown by wind currents into wheat fields adjacent to corn debris or perhaps further.

Management

Management of scab relies on an integrated combination of cultural practices. Scab is most severe where wheat is planted into infested debris of corn or other susceptible crops. Moldboard plowing reduces the inoculum but secondary tillage operations can return some of the debris to the surface. On erodible soils where tillage is undesirable, growing corn or wheat in a field only every third year has been suggested as an effective disease control strategy, although the economic feasibility is questionable. Tillage and crop rotation may not be totally effective especially where wheat is grown in narrow strips separated a short distance from corn. Planting date may also be manipulated to avoid peak discharge of *Fusarium* spores and/or wet, warm conditions at crop flowering. In several years I have observed less scab in wheat varieties that flowered early, although in 1992 I

(See HEAD BLIGHT, page 7)

Reed Canarygrass - Pros and Cons

FORAGE MANAGEMENT

Jerry Cherney
Soil , Crop and Atmospheric Sciences

The wet weather of 1992 has resulted in alfalfa stands damaged by Phytophthora root rot, and wet conditions also reduced the number of late summer new seedings. Therefore, the possibility exists for an increased number of new seedings next spring compared to a normal year. Serious thought should be given to species selection in these new forage stands. Each year, more interest is shown in low alkaloid reed canarygrass as a potential dairy feed. It has several advantages over other perennial grasses in New York state.

Only low-alkaloid reed canarygrass varieties (Palaton, Rival, or Venture) are recommended if the crop will be used as an animal feed. All common reed canarygrass seed should be considered to be high alkaloid. Low-alkaloid reed canarygrass has forage quality very similar to the other cool-season perennial grasses. If a dairy forage is desired, the spring crop must be harvested at a late boot to early heading stage (typically mid to late May). Forage quality in the spring goes from "good" to "bad" within about a one-week period. As with the other perennial grasses, reed canarygrass should be harvested before the first cutting of alfalfa if it is in a pure stand. If included in mixture with alfalfa, the cutting schedule should favor alfalfa. Reed canarygrass generally does not produce seedheads after the first cut, although the stem may elongate. It may be harvested for a second or third cut when sufficient yield accumulates.

Reed Canarygrass Advantages

- More efficient at removing excess nitrate from soil than other grasses.
- Persists longer than most perennial grasses.
- Persists with both frequent and infrequent cutting.
- Tolerates pH of 5.0 to 8.0.
- Tolerates spring flooding.
- Tolerates drought conditions.
- Fits in well in mixture with alfalfa.

Reed Canarygrass Disadvantages

- Very weak seedling.
- Very slow to establish.
- Very expensive seed.
- Seed usually in short supply.
- Companion crops not recommended during establishment.

Reed canarygrass has the potential to respond to high levels of N fertilization, but such application may not produce economically acceptable results. Where nutrient management (e.g. manure management) is a concern, this grass is very useful in that it can remove nitrate from soil even at soil temperatures that are too low for plant growth. Reed canarygrass fits in very well with alfalfa, because it is set back enough by an alfalfa harvest management so that no more than 20 to 30% of the stand is grass.

Reed canarygrass seed is very expensive because the seed shatters when ripe, and it is difficult to get a good seed harvest. This has resulted in a shortage of seed. It has a very weak seedling that is susceptible to drought as well as winter killing if does not get six weeks of growth after a late summer seeding. A spring seeding will probably not result in a full stand of reed canarygrass until two years after the seeding date. Although it does fit in well with alfalfa, if a short rotation is planned for alfalfa, reed canarygrass may not be the grass of choice.

The general consensus among researchers is that reed canarygrass is too weak of a seedling to withstand the competition from a companion crop. However, stands have been successfully established using both small grain and red clover companion crops. Companion crops currently being evaluated include small grains and small grain-field pea mixtures, as well as red clover and non dormant alfalfa.

One misconception with low alkaloid reed canarygrass is that if you plant it you are guaranteed a high quality forage. Reed canarygrass will survive when planted in very wet fields. However, the field must be accessible to machinery in mid to late May. It is pointless to expect dairy forage if a timely harvest is not possible. Reed canarygrass is not a cure-all, but it should legitimately replace some of the timothy currently grown in New York.

SOIL MANAGEMENT

Comparison of Drainage Practices for Alfalfa Production on Clay Loam Soils

Harold van Es, Soil, Crop and Atmospheric Sciences
Larry Geohring, Agricultural and Biological Engineering

Soil wetness arising from imperfect or poor drainage remains a major limitation to optimal crop production on approximately 600,000 acres of cropland and 100,000 acres of pasture land in New York. Advantages of drainage for corn production are unequivocal and well- documented. It allows for more timely field management and reduces soil compaction, excess water stress, and denitrification losses. On many New York acres, corn is rotated with alfalfa for which the advantages of drainage are less well documented.

Under our climate conditions, periods of wetness may be followed by periods of water deficit. Management of soil water by water table control allows for maintenance of adequate amounts of water in the root zone. Controlled drainage is a system which can be applied on relatively level lands with systematic subsurface drainage whereby the tile lines are closed to conserve moisture in the summer, while still allowing for drainage during winter and spring. In other parts of the country, particularly the Atlantic Coastal Plain of the Southeast, controlled drainage practices are successfully used. Controlled drainage, however, also poses a risk in that it may not allow for adequate soil water removal after drain closure resulting in water logging in wet summers. It has been shown that plant roots are very sensitive to the occurrence of excess wetness during the summer when soil temperatures are high and anaerobic conditions readily occur.

A three-year study was conducted to evaluate alfalfa production under conventional drainage, controlled drainage and no-drainage on a Muskellunge clay loam soil at the Cornell University Willsboro Farm. Muskellunge and the equivalent Rhinebeck soils are commonly found New York soils that require artificial drainage. The treatments were installed on 60'x60' plots, each with their own drainage system. Three cuttings of alfalfa were obtained during each year. For the controlled drainage treatment, drains were closed after the first cutting.

Table 1 shows total yields for 1989-1991 for each of the three drainage practices. No treatment differences were observed in the first year after establishment (1989). In the second year (1990), no-drainage resulted in yield losses of more than 10% compared to conventional drainage. Most of this was incurred during the first and second growth period when soil conditions were generally wet. Controlled drainage yielded similar to conventional drainage, although yields were slightly depressed during the second period as a result of excessive wetness after drain closure. The third year (1991) was very dry and yields for the second and third cutting were low. Yields for the no-drainage treatment were again lower in the first and second cutting. Controlled drainage did not increase soil water availability compared to conventional drainage, because no tile flow occurred in either treatment after the first cutting.

Table 1. Alfalfa dry matter yields (tons/ac).

Drainage	1989	1990	1991	total
No-drainage	6.3	5.0	3.2	14.5
Conventional	6.3	5.5	3.6	15.5
Controlled	6.3	5.5	3.7	15.5

Detailed measurements on soil properties and crop quality yielded the following information:

- Drainage does not provide for warmer soils in the spring, unlike assertions made by some in the literature.
- In the wet year 1990, water tables remained high under no-drainage until early July. This resulted in loss of root activity in the deeper part of the profile.
- In 1990, reduced yields under no-drainage were associated with lower NDF, ADF, and ADL and higher crude protein contents, which can be attributed to lower maturity from reduced growth rates due to excess wetness. In 1991, lower yields for this practice were not associated with higher quality because they were primarily the result of stand losses.
- Moisture conservation from controlled drainage was only measured in 1990 when significant rainfall occurred after drain closure. As mentioned above, this had a slight negative effect on alfalfa growth due to longer periods of saturation.

(See DRAINAGE, page 7)

Seed Certification Comes to Cornell

SEED & VARIETIES

Bill Pardee
Plant Breeding & Biometry

Seed Certification responsibilities in New York were recently assigned to Cornell. Commissioner Dick McGuire, NYS Department of Agriculture and Markets transferred these responsibilities to Cornell from the New York Seed Improvement Cooperative (NYSIC). This change is designed to expand educational functions and maintain the high quality of seed certification services in New York.

Seed certification is described in the New York Seed Law, which states that "certification in this state shall be by the state college of agriculture, or by such other agency as the commissioner of agriculture and markets may designate." In his action Commissioner McGuire fulfills the intent of this law.

Our goal at Cornell is to continue seed certification as a strong force in New York agriculture. Certification will be included in a new Seed Improvement Project, located in our Department of Plant Breeding. In this, we plan to maintain the same high standards for seed quality and service set by NYSIC over the years.

The people will remain the same. We're delighted to announce that Don Shardlow will continue to serve as Executive Manager for our seed certification programs. Phil Atkins will lead our foundation seed production for grains, working with contract growers and coordinating foundation seed distributions. Lena Gray-Dawson, will continue as the central person in our certification office, maintaining certification records and responding to seed grower requests. Steve Slack, Cornell plant pathologist will continue to coordinate potato seed certification programs. I will be involved as project leader, with particular focus on grain and forage crops.

Seed certification provides a system of inspections, standards and labels to assure users that seed is high quality and properly identified. Seed fields are examined by trained inspectors, seeking off-types, mixtures and noxious weeds. Only fields that pass stiff standards are accepted. Seed lots are sampled, and tested in the official NY seed laboratory at Cornell's Geneva station. Again, only high quality seeds that are true to variety meet certified standards. Seeds that pass these tests can then receive the "blue tag", that designates certified seed.

Maintaining the pedigree of improved seeds is central to seed certification. Certified seed can only be grown from "registered" or "foundation" seed. Foundation seed is grown directly from "breeder" seed, provided by the plant breeders who develop the variety. This direct link to the breeders assures growers that their certified seed contains all the original strengths developed in the variety. Foundation seed will be produced by Cornell, within its Seed Improvement Project.

Last year over 10,000 acres of seed production were certified in New York. Major crops included wheat, oats, barley, potatoes, soybeans, kidney beans, corn and buckwheat. Certified seed from these crops provided seed for over 200,000 acres of crop production.

Seed certification plays a key role in Cornell's research and extension programs. New crop varieties from Cornell breeders reach farmers through seed certification programs. Extension programs involving new crop varieties are also related to certification.

Seed certification will continue as an important service to New York farmers and seed growers. Cornell has accepted the challenge from Commissioner McGuire, and will carry on education and public service in seed certification. Certified seed will continue to assure growers of variety identity and seed quality.

For a directory of certified seed growers in New York or for further information on certified seed contact Don Shardlow or Bill Pardee, New York Seed Improvement Project, Cornell University, P.O. Box 218, Ithaca, NY 14851; phone 607-255-9869.

Grain Varieties Certified in NY, 1992

Wheat	Oats	Barley
Geneva	Newdak	Birka
Harus	Ogle	Chapais
Houser	Porter	Ontario
Susquehanna	Pennuda	Virtue
Frankenmuth	Hercules	Buckwheat
Fredrick	Astro	Manor
Tyler	Garry	Rye
	Noble	Aroostook

SOIL MANAGEMENT

Using Cover Crops in Corn to Capture Residual Soil Nitrate

Jane Mt. Pleasant and Mary Carter
Soil, Crop and Atmospheric Sciences

More than one million acres of corn are grown in NY and much of it is produced by the state's dairy farmers using manure application and/or following plowdown of a legume/grass sod. Since the conversion from organic nitrogen in animal and green manures to inorganic nitrogen (the form required for plant uptake) is largely determined by soil temperature and moisture, nitrogen conversion continues in the fall, long after the corn crop has been harvested. This leaves excess nitrate in the soil that can be lost by leaching. Even with best management practices, soil nitrate levels following corn silage can be sufficiently high to produce ground water contamination.

Although fall cover crops are grown primarily to provide soil protection and reduce soil erosion, they can also capture and recycle residual nitrate that would otherwise be lost. However, the short remaining growing season after harvest limits the amount of nitrogen that fall-seeded cover crops can accumulate. Many species, though, can be successfully seeded under corn at cultivation time (What's Cropping Up? Vol. 2. No. 2 1992). This earlier seeding would allow more time for the cover crop to capture residual nitrates.

Research is now underway to identify cover crop species which will take up residual nitrate and reduce soil nitrate levels following silage harvest. An experiment initiated in 1991 compares red clover, perennial ryegrass, and rape seeded at cultivation with winter rye and rape seeded after silage harvest. The experiment is being conducted at two sites in the state: the SCS Plant Materials Center in Big Flats and the Musgrave Research Farm at Aurora. Cover crops seeded at Aurora were unsuccessful in 1991 because of the drought, but most covers established well at Big Flats. Results from the first year of the trial at this site provide insight on using cover crops to reduce soil nitrate losses in corn silage systems.

By December 1991 summer-seeded rape had accumulated almost 1 ton/A dry matter and more than 60 lbs/A nitrogen (Table 1). This was substantially more than the other summer-seeded species (red clover and perennial ryegrass) and approximately seven times as much biomass as winter rye seeded after silage. By April 1992 winter rye seeded after harvest and summer-seeded rape produced about the same amount of biomass and contained equivalent quantities of nitrogen (Table 2).

Soil samples taken after silage harvest in 1991 showed lower nitrate levels at 0 to 9 inches under summer-seeded rape compared to corn with no cover crop (Table 3). By December, however, there were no differences among treatments and samples taken in April 1992 showed similar results.

These data suggest that in order to effectively scavenge nitrate, cover crops need to be established well before harvest. Winter rye seeded after harvest produced substantial dry matter by the next spring, but most of that growth occurred in the spring. By that time excess nitrate in the soil profile had already been leached to ground water with winter and spring precipitation. In contrast, rape seeded at cultivation had produced substantial biomass by late fall. Nitrogen taken up by this cover crop reduced nitrate present in the soil profile following silage harvest. Nitrate accumulated by rape was not leached to ground water over the winter.

The experiment is being repeated again this year at both sites. We want to see if this pattern of biomass accumulation and nitrogen uptake by rape and its effects on soil nitrate levels will be observed again. Results from this type of research enable us to develop cropping practices which lessen agriculture's impact on the environment.

Table 1. Aboveground cover crop biomass and nitrogen content. December 1991, Big Flats, NY.

	Dry Matter		N Content
Summer seeded	lbs/A	% N	lbs/A
red clover	621	3.11	19
perennial ryegrass	527	3.30	17
rape	1864	3.43	64
Fall seeded			
winter rye	261	4.84	13
rape	80	4.25	3

(See COVER CROPS, page 7)

COVER CROPS, from page 6

Table 2. Aboveground cover crop biomass and nitrogen content. April 1992, Big Flats, NY.

	Dry Matter		N Content
Summer seeded	lbs/A	% N	lbs/A
red clover	915	4.08	37
perennial ryegrass	981	3.20	31
rape	1299	3.70	48
Fall seeded			
winter rye	1530	2.98	51
rape	9	4.14	0

Table 3. Soil nitrate levels (0-9 inches) following corn silage under different cover crop treatments. Big Flats, NY 1991-1992.

	1991			1992
	10-18	11-1	12-1	4-24
	lbs/A Inorganic N			
Summer seeded				
red clover	47	31	13	9
perennial ryegrass	25	23	10	7
rape	12	13	6	10
Fall seeded				
winter rye	47	34	15	6
rape	32	47	17	12
No Cover	38	31	15	7
LSD .05	20	20	NS	NS

HEAD BLIGHT, from page 2

observed more scab in the early flowering varieties. The likelihood of catastrophic losses can be reduced by staggering planting dates and planting different varieties. Although varietal resistance looks promising for the future, all varieties currently recommended for New York are at least moderately susceptible to scab. We have not observed consistent, reliable disease control with currently available foliar fungicides. Fusarium seedling blight is controlled effectively in New York by planting certified seed that has been treated with a protectant fungicide. Recent evidence suggests that the germination of lightly-infected seed may improve after several months of storage since *Fusarium* survives poorly in the seed. New York wheat producers will need to give increasing attention to scab management as concern increases about mycotoxins in food and feedstuffs.

DRAINAGE, from page 4

In general, this study showed that subsurface drainage significantly improves alfalfa yields, especially for the first cuttings in the second and third year after establishment. On this particular site, adequate surface drainage was provided. If this were not the case, more serious stand losses may have been encountered due to wetness and frost heaving. Further, controlled drainage did not provide an alfalfa yield advantage on this soil type with high moisture-holding capacity. The soil water data suggests that this will neither be the case for corn. On more droughty sandy and gravelly soils with shallow water tables, however, controlled drainage is likely to be more beneficial.

Field Crop Dealer Meetings

The Field Crop and Dealer Meetings are scheduled for the following dates and locations:

October 13 ¤ Holiday Inn, Waterloo, NY
October 14 ¤ Century House, Latham, NY
October 15 ¤ Best Western, Canton, NY
October 16 ¤ Days Inn, Batavia, NY

Registration begins at 9:15 a.m. with the program underway at 10:00 a.m. The agenda features topics of current interest to those involved in field crop production in NY State along with changes in the ***1993 Cornell Recommends for Field Crops.***

Agenda

- 10:00 Introduction by Host Agent.
- 10:10 Estimating the Economic Value of Alfalfa Disease Management by G. C. Bergstrom
- 10:30 Seed Certification Changes Hats by W.D. Pardee
- 10:45 Label Changes for Atrazine Affect Recommendations by R. R. Hahn
- 11:05 Corn Development and Maturity by W. J. Cox
- 11:25 Nitrogen Soil Test by S. D. Klausner
- 11:45 GENERAL DISCUSSION
- 12:00 LUNCH
- 1:00 Herbicide Resistance Management by R. R. Hahn
- 1:20 Fungal Toxins: An Increasing Factor in Grain Marketing by G. C. Bergstrom
- 1:40 Integrated Nutrient Management: An Overview by S. D. Klausner
- 2:00 Seeding Rate Recommendations for Field Crops by W. J. Cox
- 2:20 Seeds for '93 by W. D. Pardee
- 2:40 GENERAL DISCUSSION

Calendar of Events

Oct. 6-7, '92	Northeast Regional Field Crops Insect Conference. Contact E. Shields 607-255-8428.
Oct. 13-16	Field Crop Dealer Meetings. Contact P. Kline 607-255-2177.
Oct. 25-27	Empire St. Chap. SWCS Annual Mtg., Auburn Holiday Inn.
Nov. 1-6	Amer. Soc. of Agronomy Mtgs., Minneapolis. Contact ASA 608-273-8080.
Nov. 9-12	Cornell Pest Management Conference, Sheraton Inn, Ithaca.
Dec. 3	Cornell Seed Conference, Geneva Expt. Station, Contact B. Pardee 607-255-1653
Jan. 12-13, '93	Empire State Soil Fertility Assoc., Inc. Meeting, Auburn Holiday Inn

What's Cropping Up? is a bimonthly newsletter distributed by the Department of Soil, Crop and Atmospheric Sciences at Cornell University. The purpose of the newsletter is to provide timely information on field crop production and environmental issues as it relates to New York agriculture. Articles are regularly contributed by the following Departments at Cornell University: Soil, Crop and Atmospheric Sciences, Plant Breeding, Plant Pathology, and Entomology. **To subscribe, send a check for $8.00 along with the form at the right.**

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