Kentucky FARM AND HOME Science

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READ—

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In This Issue

The Cover

This shows a portion of the weather station on the U.K. Agricultural Experiment Station farm at Lexington. In the foreground are an evaporation pan and a wind gage. Behind them is a recording-type rain and snow gage. Agronomist T. H. Taylor is taking a reading on a standard rain gage. Behind him is an official weather van in which are housed air temperature and humidity instruments. In the background Clyde Hollon, agronomy research aide, is windrowing cut soybeans for hay. More information about the weather station is in an article on pages 4-5 of this issue.

Kentucky Research Results in Brief

By FRANK B. BORRIES, JR.
Department of Public Information

RANGED-PULLETS, HOUSED PULLETS TESTED BY U.K. POULTRY STAFF

What's the best way to handle late-hatched pullets? Confine them or allow them to range?

U.K. Agricultural Experiment Station researchers, in a preliminary test conducted last season, still aren't sure which is best. That's because the confined birds were "significantly heavier" at the end of the test period than the ranged birds; but the ranged birds ate 3.7 pounds less feed than the confined birds during the 10-week period.

The test, conducted by John Begin at the Robinson Experiment Substation in Breathitt county under the direction of Charles E. Derrickson and J. E. Dalton, used two groups of birds, 448 confined to a brooder house and 447 allowed to range. Both groups were started in late summer and kept on test until the first week in November. Both got the same ration, plus whole oats free choice.

Begin and his assistants noted that mortality rate of both groups, housed or ranged, was very small. And both ate the same amount of whole oats during the test, though (as said before) the ranged chickens (with pasture available) ate 3.7 pounds less feed than the housed birds.

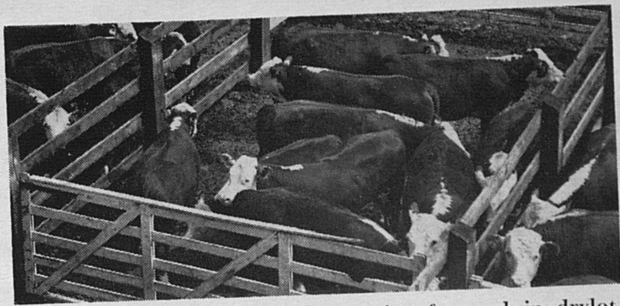
However, from November through April (when the ranged birds were housed), the ranged birds outlayed the housed birds slightly and have continued to do so.

NO RESPONSE NOTED TO ANTIBIOTIC IN U.K. STEER-FATTENING TRIALS

Although a new antibiotic known as Virginiamycin was beneficial in swine-feeding programs, it did not look promising in a beef cattle trial last year.

That's the word from Neil Bradley, U.K. Agricultural Experiment Station beef researcher. He noted that growth response to antibiotics in cattle-feeding programs has been "extremely variable; researchers and feeders are hopeful that some new untried antibiotic can be found which will produce consistent beneficial growth response in fattening cattle."

The antibiotic Virginiamycin was fed at two levels (40 and 80 mg per steer daily) to various lots of steers being fattened in drylot. At the end of 100



Virginiamycin was fed to steers being fattened in drylot. Results: "not promising."

days the 40 mg level was increased to 160 mg per head daily for the remaining 83 days of the test. One-half of the steers in each lot were implanted with 36 mg of stilbestrol. The results showed no advantage for any of the different levels of Virginiamycin regardless of whether fed to implanted or non-implanted steers.

The implants used in this experiment increased average daily gain by 0.51 pound. The Kentucky beef cattle researchers felt that this was a very significant figure since increases within the eight lots of steers were fairly uniform and also because all 80 steers used in this test were sired by the same bull. In fact, their figures show that implanted steers had average gains of 93 pounds more than the controls. This represented a gain in net value of about $22 an animal —achieved at a cost of 36 cents for the stilbestrol implant.

DAIRY COWS GETTING TRACY SORGHUM SILAGE NEED GRAIN

Dairy cows being fed Tracy sorghum silage in the dough stage probably can maintain milk production to desired levels provided a grain supplement is also fed.

The cows will need the high-protein supplement because the silage is relatively low in protein.

D. R. Jacobson, dairy research staff member, says the test was conducted last season to determine usefulness of Tracy sorghum as silage as compared with a good alfalfa feed. The latter is high in protein, incidentally. Test cows were fed Tracy silage in the

(*Continued on Page 8*)

New Weather Station in Operation On U.K. Experiment Station Farm

Climatological data to be related to plant behavior under field conditions at Lexington

By T. H. TAYLOR

"Nothing can be done about the weather" is an old saying, but is the saying as final as it appears?

What about the "fuel" in the camel's hump or the "sugar" in the Vermont maple? Or, the fat on the groundhog's back and the food in the rhizomes of bluegrass? Despite the weather, the camel arrives at the place he is going, the maple awakens early in the spring, the groundhog has sufficient energy to sleep through the cold winter when his food supply is very short, and the bluegrass plant survives droughts in summer and low temperatures in winter. None of these plants or animals do anything about the weather, but they do take the weather into consideration.

Not unlike his fellow creatures, man also takes the weather into consideration. He even tries to predict the weather from data collected from a variety of complicated instruments located in widely scattered sites all over the earth. Slowly and surely the "how and what" causes of weather are evolving.

Reliable precipitation and air temperature records have been kept in many parts of Kentucky by the U. S. Weather Bureau since the 1800's. These records are very valuable in establishing the pattern of long-run general climatic conditions. Other facets of the weather such as evaporation, humidity, wind, sunlight, and soil temperatures have not received the attention given to precipitation and air temperature. In recent years, however,, the Weather Bureau has greatly extended the number of measurements made of weather factors.

From the viewpoint of the farmer, one of the lagging aspects of "weather consideration" is the effect of weather on a particular crop he is planting, growing or harvesting. That viewpoint is shared by workers of the Kentucky Agricultural Experiment Station. Therefore, to obtain better and more useful weather information, a rather complete weather station was established on the Station Farm at Lexington in 1961.

The author examines one of three Persian lilacs used at the weather station as indicator plants. How this plant responds to temperatures and day length in the spring provides a tool for relating instrument data to biological behavior. This species, propagated by a cutting, is being used at similar weather stations in the North Central Region with which the Kentucky station is cooperating.

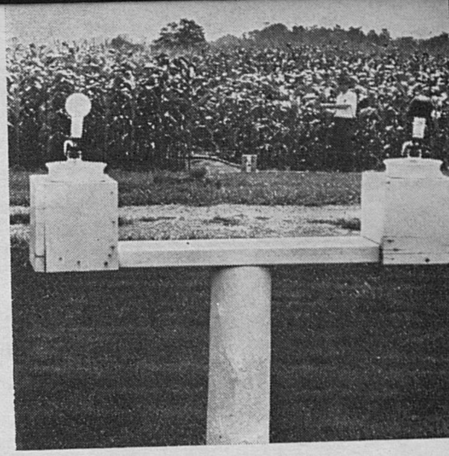
Taylor records evaporation data from a white "Livingston bulb" located 3 inches above the sod. Between the white bulb and the black bulb (right) is a metal protector over the thermocouple which measures temperature 3 inches above the sod level. In the background is the field laboratory in which recording instruments are housed.

Weather factors being measured are: wind; evaporation; humidity; type, frequency, and intensity of precipitation; temperature at various levels above and below the soil surface; dew; and soil moisture under vegetative cover and beneath bare ground. These on-site climatological data will be related to plant behavior under field conditions on the Experiment Station Farm, and the data will be organized and kept as a reference for future work.

Similar weather stations have been established in five southeastern states in a cooperative regional venture to describe more precisely the climate near the ground. Standard measurements are being made at all the stations so that the data can be compiled and processed by high-speed computers. These data will be published at regular intervals. At a future date we should be able to describe more precisely the micro climate—the zone where plants grow.

With the proper considerations of weather, it is possible that farmers may make hay in Kentucky without having it rained on, engineers can design a more effective furnace control system, and horticulturists can grow peach trees that bear fruit each year.

For many years the farmer has used certain phases of the moon, the size of oak leaves, the return and departure of summer birds, and the sounds of trains and rivers as indicators of when to plant, cultivate and harvest crops. These signs are readily available in the "non-scientific" society—and they have been really very useful. The question might be asked, "How scientific are these non-scientific indicators?" Answers to this question would undoubtedly aid in the understanding of some of the problems of agriculture. It is quite probable, however, that present and future farmers will use as effectively the "scientific signs" in their society as their fathers and grandfathers used the "non-scientific signs."



In the foreground are two Livingston evaporation bulbs 5 feet above the sod. In the background are experimental corn plots planted at three different times — April, May, June. Growth behavior of the corn is being related to measured weather factors.

Graduate student Joe England inspects recorded data on the multilogger in the field laboratory. This instrument can record data from 144 separate temperature sites if desired. Thermocouples are used at the sites, with small wires connected to the multilogger.

With the use of a newly developed instrument, the neutron meter, England measures soil moisture under a bluegrass cover. The meter, which utilizes radioactive material, simplifies soil moisture measurements. It is portable and, thus, can be used at other sites on this farm and on other Experiment Station farms to measure moisture at various depths in the soil profile.

STUDY EFFECTS OF DIFFERENT VENTILATION METHODS ON

Winter Vegetables Under Plastic

By DEAN E. KNAVEL and E. M. EMMERT

Department of Horticulture

Summary

Several cool-season crops were grown to maturity from transplants and seeds in plastic houses without artificial heat during February, March, April, and May. Interlayers of plastic were positioned within two different houses to trap solar heat. The objective was to determine which crops grew the best under different systems of ventilating the fieldhouses.

Yields in House 2 where the interlayers of plastic were suspended 4 feet above the soil level were greater than yields in House 1. Yields in House 1 where the interlayers of plastic were low over the plants were higher on the south side than the north side. The north side of House 1 was ventilated by a fan pulling air from the outside when the temperature reached 58°F. The temperatures of the north side were more uniform because of the fan, than those of the south side which was ventilated by folding back the plastic layers and lifting the side walls. Temperatures in House 2 were cooler at night and warmer during the day than in House 1.

On the basis of gross returns to the grower, bibb and leaf lettuce offered the greatest returns at premium market prices.

Winter vegetable production under plastic is a growing industry in Kentucky. Lettuce, tomatoes, pole beans, and fresh market cucumbers are popular crops for growing in plastic greenhouses. Other crops a grower might consider are endive, spinach, kale, parsley, rhubarb, and radish, but the profits in growing them may be questioned.

Production costs can be reduced by using plastic fieldhouses as designed by Emmert.[1] Emmert's low-cost fieldhouses allow the grower to produce certain crops to maturity out of season without the added construction cost of conventional plastic houses and the use of artificial heat. Fieldhouse construction costs 5 to 7 cents per square foot as compared with 30 to 50 cents per square foot for the regular-type plastic houses. Heating greenhouses in Kentucky with coal or gas amounts to approximately 8 to 10 cents per square foot of growing space. The use of fieldhouses, however, removes the heat cost when interlayers of plastic are used to trap and hold solar heat. This system has protected lettuce, a cool-season, crop, from frost injury when outside temperatures fell to 10°F.

The objective of this experiment was to study the performance of certain cool-season vegetable crops in plastic fieldhouses under different methods of ventilation.

Methods and Description of Experiment

Three systems of ventilation were used in two different houses. The fieldhouses were oriented east and west. House 1 was divided into a north and south side, with both sides having two layers of ¾-mil polyethylene approximately 2 feet above the soil level and suspended on No. 9 wire wickets, as shown in Fig. 1.

The north half of House 1 was ventilated by a thermostatically controlled fan which cut on when the inside temperature exceeded 58°F. The fan was placed in the center of the north side to pull air from the outside. The air was blown toward both ends underneath the plastic covers. The south half of the house was ventilated by rolling the layers of plastic toward the outside wall when outside temperatures reached near 80°F during the day. During very warm days in late spring, additional ventilation was provided by raising the south outer plastic walls.

House 2 was parallel to House 1 but differed from House 1 and Emmert's system in that the two interlayers of plastic were suspended 4 feet above soil level. The plastic covers were supported by wooden stakes and a wire frame construction through the center and over the walk-way of the house, as shown in Fig. 2. Ventilation on warm days was accomplished by raising the south outside plastic walls and end doorways.

Thermometers were placed on the soil surface at random in each house, and high and low temperatures were recorded each day from March 6 to April 21. A thermometer was also located on a post outside the houses to record outside temperatures.

[1] Emmert, E. M. (1960) New Look in Field Greenhouses. American Vegetable Grower 8 (2): 17, 59.

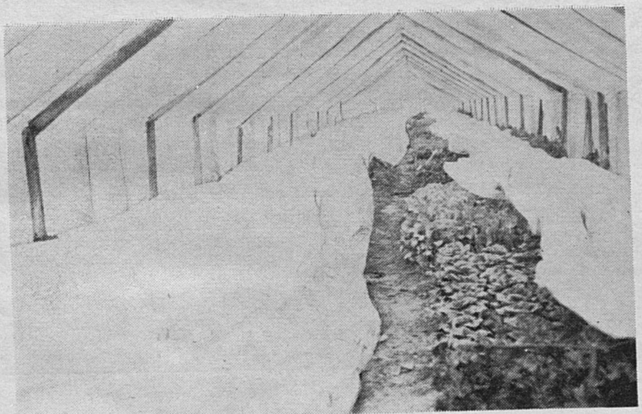


Fig. 1.— Layers of plastic were suspended on No. 9 wire, approximately 2 feet above the soil level to trap solar heat in House 1.

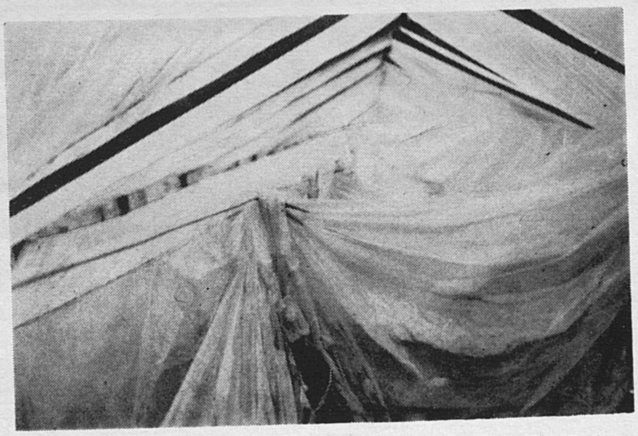


Fig. 2.— Layers of plastic were suspended approximately 4 feet above the soil level in House 2.

Two varieties of lettuce, kale, spinach, endive, and radish were grown with one variety of parsley and one variety of rhubarb. Lettuce and kale were transplanted. Rhubarb was grown from two-year-old crowns. The other crops were direct seeded and thinned. All crops were planted on February 15, 1961.

Lettuce, kale, and endive were spaced 9 x 9 inches. Spinach and parsley were thinned to stand 3 x 6 inches, and radish was thinned to stand 2 x 2 inches. Rhubarb was spaced 12 x 12 inches. Each variety was replicated twice in the north and south sides of each house. The plot size for lettuce, kale, spinach, and endive was 4 x 7 feet. The plot size for the other crops was 4 x 3.5 feet.

Results and Discussion

Yields (Table 1) for all crops, except Grand Rapids lettuce, were higher in House 2 than in House 1. Grand Rapids lettuce grew better on both sides of House 1 than on the south side of House 2.

Table 1.— Yields (lb of fresh product/1000 sq ft) for cool-season vegetable crops harvested in fieldhouses in 1961

Crop	Variety	House 1 Low Cover North (Fan)	House 1 Low Cover South	House 2 High Cover North	House 2 High Cover South
Lettuce:	Bibb	523	653	748	787
	Grand Rapids	970	965	1,171	854
Kale:	Siberian	542	758	893	849
	Dwarf Green	......	......	887	845
Spinach:	Dixie Market	120	173	860	374
	Long Standing Bloomsdale	......	......	490	451
Parsley:	Vaughns XXX	(not harvested)	172	384	364
Endive:	Moss curled	617	787	830	816
	Broad leaved Batavium	......	......	854	838
Radish:	Crimson Giant	163	317	816	662
	Cherry Belle	......	......	605	461
Rhubarb:	McDonald Red	557	710	797	760

Within House 1 all crops, except Grand Rapids lettuce, yielded greater on the south side than on the north side. Within House 2 yields for all crops, except bibb lettuce, were slightly greater on the north side than the south side. Figure 3 shows bibb lettuce in House 2.

Fig. 3.— Note the even growth of bibb lettuce in House 2.

House 2 had cooler night temperatures and warmer day temperatures than either side of House 1 (Table 2). The south side of House 1 was also warmer during the day and cooler at night than the north side of the same house. The fan in the north side of House 1 maintained a more uniform temperature during the day and night than did the other forms of ventilation. However, even though the temperatures were within the range for good plant growth,

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Plastic Greenhouse Ventilation

(Continued from Page 7)

Table 2.— Mean maximum and minimum temperatures recorded inside and outside of the fieldhouses from March 6 to April 21 in 1961

	House 1 North (Fan)	South	*House 2*	*Outside*
Maximum	80.5(96)*	84.6(108)	87.9(108)	56.2(75)
Minimum	46.8(36)	44.1(33)	39.0(28)	33.9(23)
Av. daily means	63.7	64.4	63.5	45.1

* Temperatures within parenthses refer to single high and single low recorded.

the crops, except leaf lettuce, did not respond well to the uniform growing temperatures. Growth was uneven where the fan was used, with more growth occurring toward the center aisle than along the outside wall (Fig. 4).

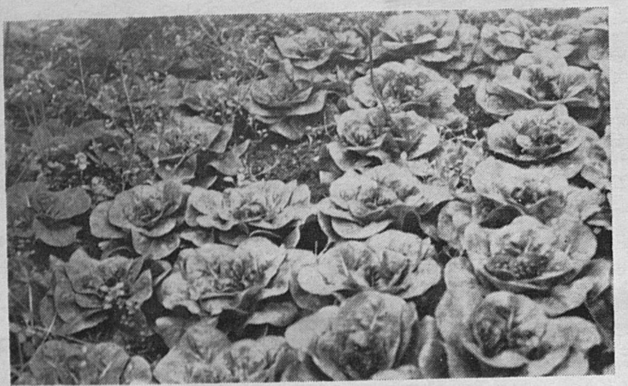

Fig. 4.— Note the uneven growth of bibb lettuce grown in the north portion of House 1.

Although the crops tested were considered cool-season kinds, they seemed to require warm day temperatures for proper development. Where the inside double layer of plastic was well above the crops in House 2, cool nights and warm days, combined with sufficient ventilation, created a favorable atmosphere for plant growth and high yields. Elevating the inter-layers of plastic allowed a lower mean temperature than did either treatment in House 1, but the average daily mean temperatures were about the same for both houses.

Market prices, harvest dates, and probable gross returns to the grower are presented in Table 3. On

Table 3.— Market prices* paid at the Cincinnati produce terminal on April 3, 17, and May 19, 1961, for vegetable crops and the probable gross returns to a grower on basis of highest yields obtained in this experiment

Crop	*Harvest dates*	*Unit price*	*Gross returns*
Bibb lettuce	April 3	$2.50/5 lb	$350.00
Leaf lettuce	April 3	3.50/10 lb	353.00
Kale	April 17	1.50/bu	145.00
Spinach	April 17	2.50/bu	77.50
Radish	April 17	1.25/15 lb	60.00
Rhubarb	April 17	7.00/50 lb	217.00
Parsley	May 19	3.00/bu	54.00
Endive	May 19	1.25/16 qt bkt	115.00

* U.S.D.A. Market Service Report.

the basis of prices paid at the time the crops in this experiment were harvested, lettuce offered a greater return per area of growing space than did any of the other crops, even though yields of the other crops were satisfactory and market prices were high for them.

Kentucky Research Results in Brief

(Continued from Page 3)

"dough" stage; another group was fed silage made from early milk stage Tracy; and a third, alfalfa.

Cows on the dough stage silage ate more dry matter and produced more milk than cows on early milk stage silage, it was found. The dough stage silage had 65.9 TDN (total digestible nutrients) per 100 pounds of forage dry matter compared to the early milk stage silage's 61.6 TDN per hundredweight. But protein digestibility of both types was low (less than 50 percent) and the protein content also was low. Therefore, Jacobson says, milk production could NOT be maintained at levels as high as that of cows on alfalfa hay unless the sorghum-fed animals got a grain supplement to raise the protein level.

He said the superiority of the dough-stage sorghum silage over the early milk stage was proved in the test. And, he added, if the protein is added to the ration, the dough-stage sorghum silage should maintain milk production at levels comparable to that of cows on the alfalfa hay.

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