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Vol. XVIII No. 3

How Now, Fat Cow?

(See Page 3)

THIS COLLEGE DEPENDS UPON ITS FRIENDS

If your family came from the Midwest, your father doubtlessly read, at times, The Chicago Tribune, including a sparkling daily column, "In the Wake of the News."

That column depended heavily upon reader-contributors, and interspersed in each day's column was a couplet: "The Wake Depends / Upon Its Friends." The same couplet is applicable to all successful human organizations even to this day.

This College of Agriculture, successful in research achievement, in extension activity and in teaching young people, is heavily dependent upon its friends. To list a few is to omit many.

Even so, there immediately comes to mind the university administration which facilitates our work, the county, state and federal governments which support us, the private companies whose research grants help underwrite our activities, the news media which help tell of those activities, and Land-Grant colleges in other states which share with us many regional studies.

Of underlying importance are the people of Arizona, those who support 4-H youth activities, the high schools where FFA chapters thrive, the membership of commodity organizations dealing with livestock, cotton, citrus, field crops, commercial vegetables and other horticultural production, as well as those engaged in the processing and marketing of such products.

We've named a few — and overlooked many, not on purpose but just because there are so many. In any event, we feel deep humility and great appreciation for those whose help and encouragement have given our efforts worth.

Maybe it's time for a new slogan:

"THIS COLLEGE DEPENDS UPON ITS FRIENDS"

Harold E. Myers

Dean
College of Agriculture
and

PROGRESSIVE AGRICULTURE IN ARIZONA

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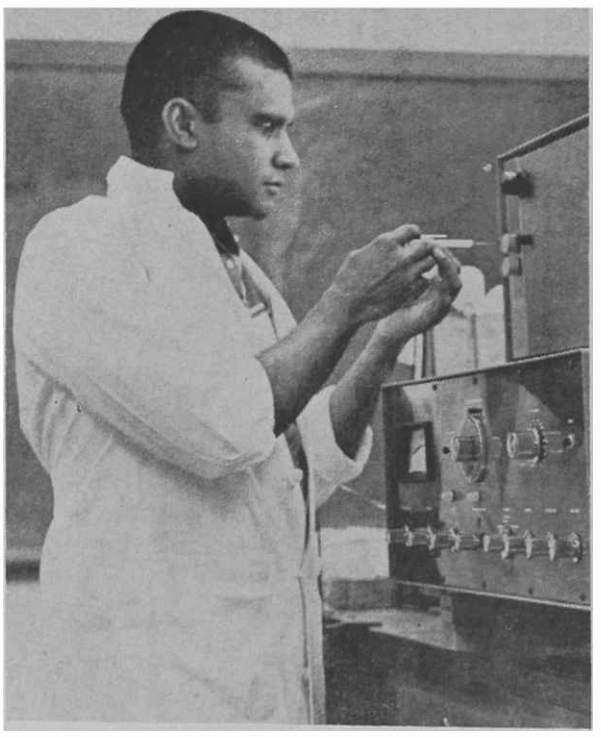
Our Cover Picture



Our cover picture ties in with the article starting on an adjoining page. It shows one of the co-authors, Kasheed Mohammed, operating the gas chromatography equipment for fatty acid analysis. These research scientists are trying to learn more about the fat portion of milk, and the physiology of the bovine involved in its production.

IN THIS ISSUE

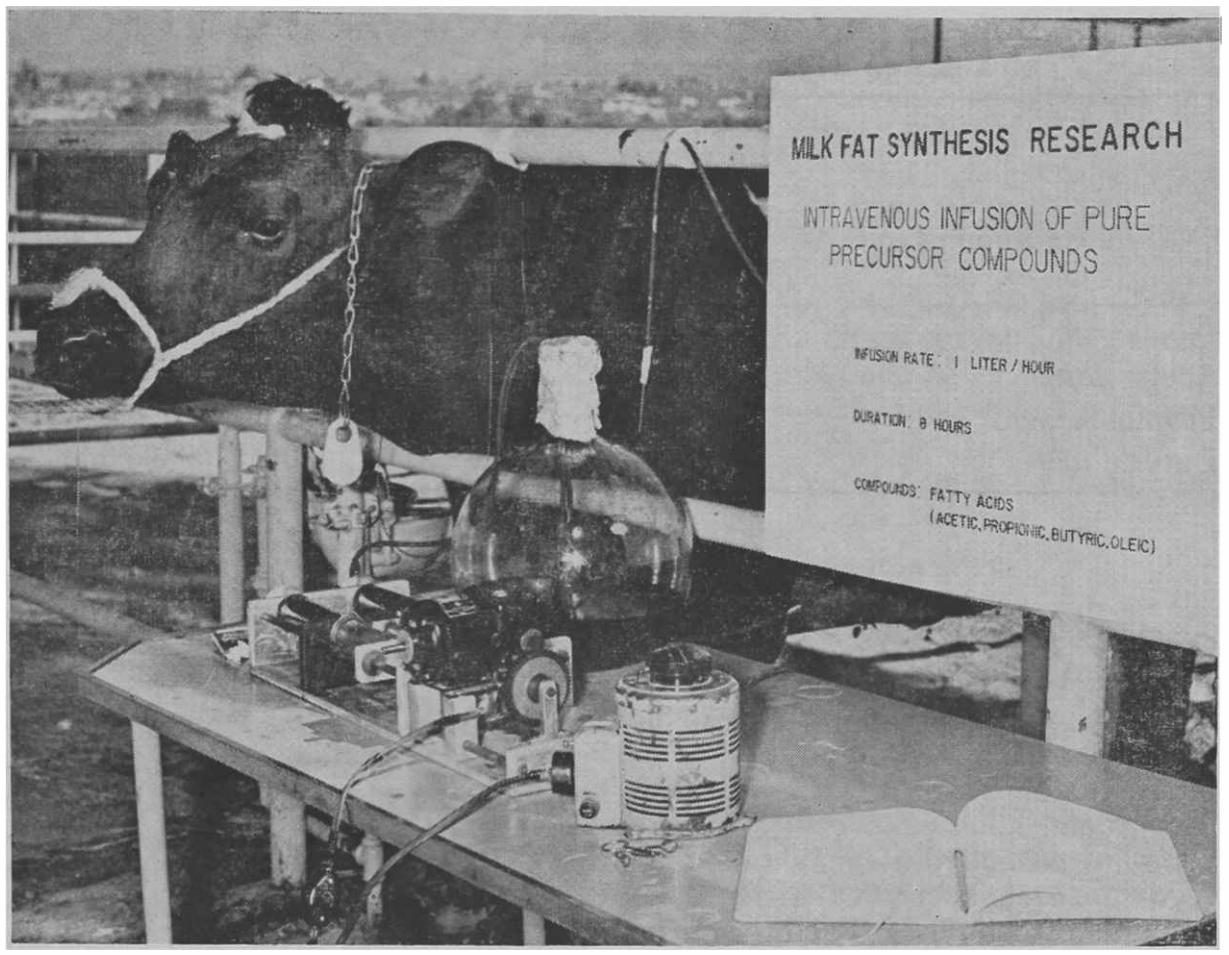
North - South Cotton Rows Produce Most

Research at the U. S. Cotton Research Station at Shafter, Calif., demonstrates that north-south rows use the sun's energy more efficiently than east-west or other row directions.

Seed cotton yields were reported as follows:

Direction	*1963 Skip Row*	*1964 Skip Row*	*1964 Solid*
East-West	5910	5463	3661
SE-NW	5870	5525	3649
SW-NE	6000	5896	3743
North-South	6800	6214	3907

AN EXPERIMENTAL ANIMAL is here being given continuous intravenous infusion of pure compounds. →



By Kasheed Mohammed,

J. W. Stull, and

W. H. Brown

Research Looks at the Cow's Fat-Making Factory

While there is much current interest in the importance of the non-fat constituents in milk, the fat portion is still a very valuable component. In addition to being of great economic importance to the producer, milk fat is a source of high food energy, supplies significant amounts of vitamins A, D, E, and K, and imparts unique, appealing flavor characteristics to dairy foods.

Factors affecting variation in amount of fat produced in milk have been studied comprehensively at this station and elsewhere. For example, some of the factors that can adversely affect the amount of fat produced in milk are feeding practices which utilize: (a) high concentrate-low roughage rations, (b) heat-treated grain concentrates, (c) large quantities of unsaturated fats in the ration, and (d) pelleted, finely ground roughage.

Although some information is known about the factors that affect the way the cow makes milk fat and composition of milk fat, much remains to be found out concerning these aspects of milk fat production.

Table 1. Influence of Ration Upon Fatty Acid Content of Milk Fat

Fatty Acids in Milk Fat		*Ration Containing Cottonseed Oil Meal* (%)	*Coconut Oil Meal* (%)
Lauric,	C_{12}	3.69	7.06
Myristic	C_{14}	11.38	13.64
Palmitic,	C_{16}	30.06	30.36
Stearic,	C_{18}	7.77	5.25
Oleic,	$C_{18:1}$	21.85	22.03

Scientific Study of Fat

Basic research in this Department of Dairy Science is shedding some light on the metabolism, composition and production of milk fat. Materials which are involved in the making of milk fat, and the milk fat itself, are analyzed by a new method called gas-liquid chromatography. At this point, it is too early to predict what the practical application may be of the results or information obtained from research of this type. Basic research such as this, however, must be available to answer questions which many times are not apparent at the moment.

(See Photo on Facing Page)

(Continued on Next Page)

Kasheed Mohammed is a graduate student, J. W. Stull and W. H. Brown are professor and associate professor respectively, in the Department of Dairy Science.

Table 2. Influence of Pure Compounds and Methods of Administration on Change in the Percent Milk Fat.

Pure Compound Given	*Method of Administration*			
	Fed		*Intravenous Injection*	
	High Milk Fat	*Low Milk Fat*	*High Milk Fat*	*Low Milk Fat*
	Change in % fat			
Acetic acid	+1	+2.8	+0.5	+1.8
Propionic acid	–1.5	–0.2	–1.3	–0.2
Butyric acid	+2.5	+3.8	0	0

(Continued from Previous Page)

It is a type of insurance for the future.

The cow has a unique gastric or digestive system, with a large fermentation compartment called the rumen. The rumen allows the cow to utilize complex carbohydrates as found in feed materials containing large amounts of cellulose. Bacteria in the cow's rumen break down these complex substances into simpler compounds called fatty acids.

These are known by such names as acetic, propionic, butyric and valeric acid. The fatty acids are used by the cow as energy required for body maintenance and milk production. It has been found that when there is a high ratio of acetic to propionic acid, the percent of milk fat is increased. Conversely, when the ratio of propionic acid produced is greater, milk fat percentage is markedly lowered but the weight of the animal increases.

Special Feeding Techniques

In order to understand more completely how milk fat is made in the mammary gland, systems and materials related to milk fat production are studied. These include the rumen contents, blood, liver and body fat tissue. In the work, experimental animals (some producing milk fat at 3.5% or higher and others producing abnormally low milk fat at 1.5% or lower) are given various pure compounds and other materials both orally and by intravenous infusion.

The effect of feeding various materials on fat content and composition is illustrated in Tables 1 and 2. It is expected that, as this research progresses, explanations for the reasons for the observed differences will be more clearly understood.

Ag. Travel Course Repeats This Year

So successful was last summer's "Classroom on Wheels," sponsored by this college, that a second such travel course is planned for this summer.

Co-instructors on this year's tour are Dr. Arden D. Day, professor of agronomy, and Dr. J. D. Schuh, associate professor of dairy science.

This agricultural travel course by bus will extend 7,000 miles and pass through a dozen states. Students will make detailed notes, take photos of points of interest, and will receive college credit for the course.

In general, the ecological aspects of different climate zones, the relationship between natural forces and agriculture of the region, the production and handling of agricultural products, aspects of new scientific techniques and effects of urbanization, all will be fruitful for study.

Regular stops will be made at campuses of other Land-Grant universities, and at points of agricultural concentration and marketing. Programs are arranged for local persons at each site to discuss aspects of the region and its agriculture.

Scheduled stops will be made at Las Cruces, N. M.; Amarillo, Texas; Oklahoma City, Okla.; Kansas City, Kans.; Ames, Iowa; Minneapolis, Minn.; Fargo, N. D.; Billings, Mont.; Pullman, Wash.; Portland, Ore.; San Francisco and Los Angeles, Calif. The five week travel course will leave Tucson about June 6.

Cochise County
- KAWT, Douglas — 6:15 a.m. Mon. through Fri. 12:20 p.m. Monday through Friday
- KHIL, Willcox — Mon. thru Fri., 6:05 a.m.

Coconino County
- KCLS, Flagstaff — Tues. and Thurs., 8:45 a.m.
- KCLS, Flagstaff (Home Agent) — Wed., 10:15 a.m.

Gila County
- KIKO, Globe-Miami Monday, 12:45 p.m.

Graham County
- KATO, Safford—Sat., 9:30 a.m. Mon. thru Fri., 12:45 p.m. (daily)

Maricopa County
- KTAR, Phoenix—Mon. thru Fri., 5:55 a.m.
- KOY, Phoenix—Tues. thru Sat., 5:40 a.m.
- KOY, Phoenix—Sunday Garden Club of The Air, 8:35 a.m.
- KPHO, Phoenix—Mon., Cotton Report, 12:40 p.m.
- KPHO, Phoenix—Thurs., Dairy and Livestock Report, 12:40 p.m.
- KUPD, Phoenix—Mon. thru Fri., 5:30 a.m. and 12:30 p.m.

Mohave County
- KAAA, Kingman — Mon., 9:06 a.m. (Extension Home Economist)

Navajo County
- KDJI, Holbrook — Tues., 1:00 p.m.-1:15 p.m.
- KINO, Winslow — Sat., 12:15-12:30 p.m.

Pinal County
- KPIN, Case Grande—Mon. thru Sat., 6:55 a.m.; Mon and Fri., 9:30 a.m.; Tues., Thurs. 11:30 a.m. on Monday and Wednesday and Sat., 12:20 p.m.

Yavapai County
- KYCA, Prescott — Mon., Wed., Thurs. and Fri., 3:45 p.m.
- KNOT, Prescott — Mon., Wed. and Fri., 6:25 a.m.
- KVIO, Cottonwood—Mon. and Fri., 8:15 a.m.

Yuma County
- KVOY, Yuma — Mon. thru Fri., 5:45 a.m.
- KYUM, Yuma — Tues., Thurs. and Sat., 6:25 a.m.
- KYUM, Yuma — Saturday, 4-H Program, 10:05 a.m.

PROPOSED SONORAN DESERT PARK

By Walter S. Phillips

In 1937 an area of some 330,000 acres south of Ajo was set aside as the Organpipe Cactus National Monument to preserve an example of the Sonoran Desert. This area contains an outstanding display of the Organpipe Cactus (*Cereus Thurberii Engel.*) which is found on the south-facing hillsides. In addition to this cactus, which gives its name to the park, another cactus, Sinita (*Cereus Schottii Engelm.*) is rarer, and occurs in only a few isolated patches along the American side of the international border with Mexico.

Two years later (1939) an area to the west of the Monument was set aside as the Cabeza Prieta Game Range. This area, of about 860,000 acres, administered by the U.S. Bureau of Sport Fisheries and Wildlife, was established to protect a small remnant herd of the Sonoran Antelope as well as the Desert Bighorn Sheep.

Used by the Military

Since the beginning of World War II, travel in the Game Range has been very restricted because it is used as a military aerial target range. As long as the area is useful to the military, access will continue to be restricted because of the danger of unexploded shells and other dangerous military hardware. Plans, however, are being made to add this picturesque basin and range type of topography to the National Park system, should the area be abandoned by the military.

To this end, Representative Morris K. Udall introduced a bill in Congress to combine the present Organpipe Cactus National Monument and the Cabeza Prieta Game Range as a single unit to be called the Sonoran National Park. In the future, it is projected that a similar area on the Mexican side of the boundary, including the famous Pinacate Lava fields, might be set up by the Mexican government to make this a truly International Park of great importance and pride to both Mexicans and Americans.

Three Types Preferred

The park service and its advisory committees look for outstanding samples of our country and its history in establishing new parks. They are interested in three general types or areas: 1) natural areas; 2) historical areas; 3) recreational areas. This proposed Sonoran National Park, consisting of about 1,930 square miles and over a million acres, fits into all three of the above categories.

As a natural area it is unexcelled. Practically uninhabited, and with grazing and mining claims at a minimum, it has had but little disturbance by modern man.

The present Sahuaro National Monument, near Tucson, includes only the eastern types of the Sonoran Desert where they lie adjacent to the Sonoran grasslands and woodlands. From these grasslands westward there is a gradual change, with less rainfall and a modification of temperatures until we reach the Colorado Desert (sometimes called Yuman Desert), where climates are more severe.

The western types of the Sonoran Desert are not now protected in any park. A transect from the present Monument westward to the Colorado River would give a true transition from the Sonoran to the Colorado Desert. There are no other parks, in either the United States or Mexico, where this type of vegetation is so well portrayed.

Of Historic Importance

As an outstanding historical area, the time from the remote past to the modern is accounted for within the boundaries of this park as at present delimited. Prehistoric people lived in, or more frequently traveled through, this area. Because it was on trade routes from the salt waters of the Gulf of California to the inland areas, there has been a definite mingling of cultures. Salt and shells were traded and carried through the park, and camps of these traders, temporary and semi-permanent, are found within the park. An archeological survey of the region, brief but important, located some 34 sites within the boundaries of the proposed park. More sites of prehistory are added to the list each year.

The Spanish influence on this part of the United States is also present, although physical evidence is lacking. Many places, however, especially the springs and water tanks, are frequently mentioned in the writings of the early Spaniards, from Bernal Diaz in 1540 A.D. to Padre Eusebio Kino and others at later times.

The early attempts of modern man to cross the area on the way to California, especially during the gold rush days of the 1850's, made the Camino Diablo a famous name, known and feared by many. This part of our history and the opening of the west and southwest is still to be researched.

Renewed Interest in the Area

The area is often looked upon as wild, desolate and a barren panorama with but little value. Experience is showing that arid lands, of which this is a prime example, not only were the homes of ancient civilizations but more and more are coming back in importance with the population explosion. The loneliness of the region may be one of its greatest attributes in the future. Experience in the Death Valley National Monument shows that people want to see and enjoy this solitude.

That the wildlife of the area needs protection goes without saying. However, by wildlife is meant all living things, reptiles, insects, flowers as well as the few game animals. Because of the fluctuating climate of this region it is doubtful if game animals would ever reach a harvestable number. The National Park Service has been able to handle game animals as well as smaller wildlife in other parks and its new policies, as set down by the Leopold report, could easily take care of the wildlife of this region. (Dr. A. Starker Leopold is a recognized authority. He is head of the advisory board of Wildlife Management of the National Parks Department).

In looking to the future, this area seems like a natural to become one of the outstanding attractions in Arizona. One of the features of this area should be to keep it as near pristine as possible. Soon there will be all too few areas where solitude reigns.

Dr. Phillips is Professor in the Botany Department.

High Yielding and Yellow Dwarf Tolerant

Mesa, New Oat For Southern Arizona

By R. K. Thompson

Rex Thompson is Research Associate in Agronomy at the Mesa Branch Experiment Station.

REX THOMPSON COMPARES standing ability of Kanota x Wild Oat selections ← (on right) with early maturing Palestine (center) and Markton (extreme left).

A new combination forage or grain oat variety has been developed and released for use in the low altitude, irrigated areas of Southern Arizona. It has performed well in the production of grain, pasture forage, and hay. This high yielding oat has some tolerance to the yellow dwarf virus. The variety was named "Mesa" after the area in which it was developed. It is a joint release of the Department of Agronomy of The University of Arizona, and the Crops Research Division, Agricultural Research Service, U. S. Department of Agriculture.

Mesa is an oat selection from a Kanota (*A. byzantina*) X Wild Oat (*A. fatua*) cross. The original cross was made by C. A. Suneson at Davis, Calif. The bulk F_7 seed of this cross was brought to Arizona by R. T. Ramage in 1959. Selection and evaluation was done at the Mesa Branch Experiment Station.

In addition to furnishing a natural adaptation for Arizona growing conditions, the wild parent contributed many undesirable characters such as hairy lemmas, seed dormancy, shattering and maturity extremes. These were discarded by growing the early generations of the bulk under field conditions of planting, harvesting and selection. The bulk F_7 remained quite variable. Mesa is the result of a five-year evaluation program starting in 1960 with 1,000 random head selections from the bulk.

Stands Up Well

Compared to recommended Arizona oat varieties, Markton and Palestine, Mesa has good standing ability and is intermediate in height and maturity. A striking feature is its very dark green, luxurious vegetative growth.

While yellow dwarf virus resistance is not complete, Mesa has considerable tolerance to this disease. This is a character contributed to the species cross by the tame oat parent, Kanota.

Seeds are light colored, yellowish-red, large, long, plump, and are produced on a relatively compact panicle. Seed weight is almost always greater than that for Markton or Palestine, and often may be in excess of 35 pounds per bushel. Limited grain sample analyses indicate that the Mesa oat is somewhat lower in fat content and higher in nitrogen-free extract, while crude protein and crude fiber content is at about the same levels as Markton and Palestine.

Outyields Others

Mesa oats have produced five percent higher grain yields than Palestine and 45 percent more than Markton in three years of replicated yield tests at Mesa, Tempe, Yuma, and Safford (Table 1). One border size seed in-

(Continued on Next Page)

Table 1. Grain Production of Mesa Oats Compared with Palestine and Markton Varieties.

Variety	Average Grain Yield in Percent of Palestine Oats			
	1963 2 tests	*1964 3 tests*	*1965 7 tests*	*three-year average*
Palestine	100	100	100	100
Mesa	105	112	99	105
Markton	47	81[1]	53[2]	60

[1] average is for 2 tests
[2] average is for 3 tests

Table 2. Pasture Production of Mesa Oats Compared with Markton and Palestine Varieties at the Mesa Branch Experiment Station. Grazing was Simulated by Clipping Seven Times Each Season at the Onset of Jointing.

Variety	Average Green Pasture Forage Yield in Percent of Markton				
	1964		*1965*		*Two-year*
	Test 1	*Test 2*	*Test 1*	*Test 2*	*Average*
Markton	100	100	100	100	100
Mesa	103	89	118	115	106
Palestine	91	—	112	—	101
Yield of Markton in tons per acre	10.9	16.8	13.7	14.1	13.9

Table 3. Hay Production of Mesa Oats Compared with Markton and Palestine Varieties at the Mesa Branch Experiment Station. Harvest was Made in the Early Head Stage of Plant Development.

Variety	Average Oven-dry Hay Yields in Percent of Markton				
	1963[1]	*1964*	*1965*		*Three-year*
			Test 1	*Test 2*	*Avergae*
Markton	100	100	100	100	100
Mesa	96	82	90	106	92
Palestine	131	58	74	82	89
Yield of Markton in tons per acre	2.7	5.3	5.9	6.6	

[1] Vegetative growth froze back to ground level in mid-January. Consequently two harvests were made, one in late January and one when the oats were headed. Neither produced normal yields.

(Continued from Previous Page)

crease block at Mesa in 1964, with a seeding rate of 20 pounds per acre and harvested with a combine, produced a calculated yield of 4700 pounds per acre.

The performance of Mesa oats, when pasture conditions were simulated by clipping near the onset of jointing, has been very good (Table 2). Average green pasture forage yields of four replicated tests at Mesa in 1964-65 were six percent more than that of Markton, the oat most commonly used for pasture forage in Arizona. Mesa outyielded Markton by 13 percent dry matter in a similar test at Yuma in 1965.

Mesa hay yields, when harvested at the early head stage of growth, have generally been intermediate between Palestine and Markton (Table 3). Production which will approach or compete with Markton can be expected when Mesa oats are seeded early under optimum growth conditions, or when harvest is delayed until seed formation.

Both Forage and Grain

Whereas the Markton oat is primarily a forage type, and Palestine is a grain oat, Mesa will be useful for either forage or grain. The area of adaption and limits of frost tolerance beyond the irrigated areas of Southern Arizona haven't been determined.

A limited supply of foundation and certified seed will be available this fall.

"Head Start" Grant To Home Economics

A federal grant of $21,254 from the Office of Economic Opportunity has been awarded to the Division of Child Development and Family Relations in the School of Home Economics.

Dr. Victor A. Christopherson, head of the division, said the grant will assist in financing a regional training and consulting program under Title II-A of the Economic Opportunity Act. The program, he said, is to enable preschool children in subcultures to become acquainted with the middle-class culture.

The grant also permits the division to employ a regional consultant for the entire state. This consultant is Mrs. Joyce Huggins, who has had extensive experience with preschool children and was previously child care consultant with the state Child Welfare Division. Mrs. Huggins will travel throughout Arizona as a consultant to "Head Start" programs, and will participate in training programs for Head Start teachers.

People interested in developing training programs for local Operation Head Start programs should contact their local community action organization or may write directly to Mrs. Huggins at the School of Home Economics, University of Arizona.

MAY

5—Cattle Feeders Day, U of A Casa Grande Highway Farm, Tucson

6—Poultry Industry Day, U of A Poultry Research Center, Tucson

JUNE

6-10—Town and Country Life Conference, U of A Campus

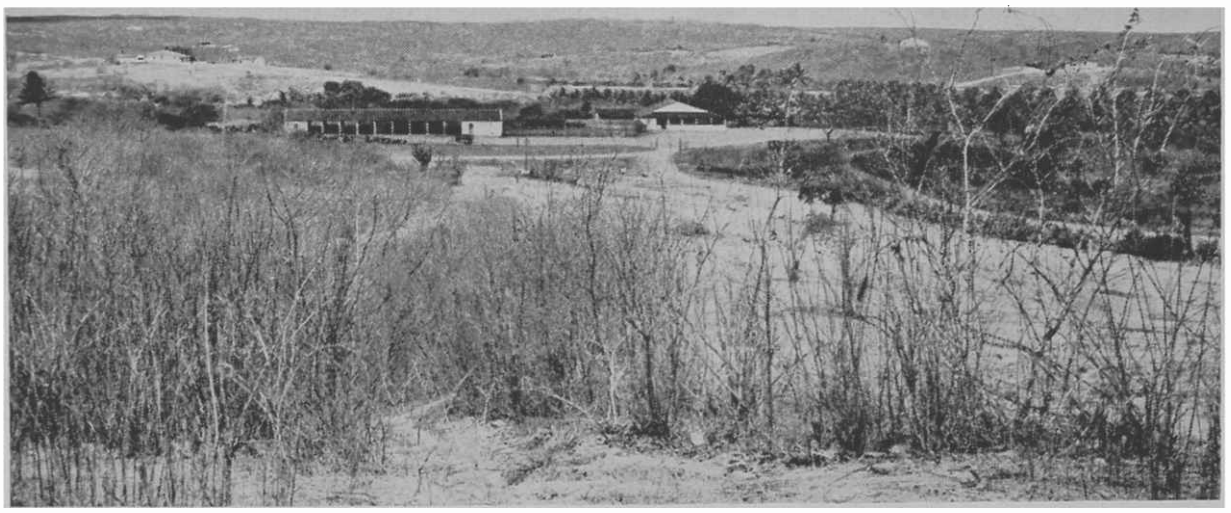
6-10—State 4-H Junior Leader Laboratory — Shadow Valley Ranch, Prescott

JULY

11—Hereford Field Day, Prescott

25-29—State 4-H Roundup, U of A Campus, Tucson

UNIVERSITY OF CEARA EXPERIMENTAL FARM



ABOVE, GENERAL VIEW of the Experimental Farm. The center structures are present headquarters buildings.

By Barton C. Reynolds

Providing completely new physical facilities for total agricultural research investigations is a terrific task, but the University of Ceará has undertaken the job.

Not only are instructional and research laboratories being built on campus, but a start is being made to provide field facilities as well. It is to this latter effort that this discussion is directed.

Some time prior to the arrival of the Arizona team, the university administration decided that the main research field facility of the Escola de Agronomia should be developed at some distance from the campus. The campus is located near the western limits of the city of Fortaleza.

Three tracts of land were acquired and put together to form the unit for the Agricultural Experimental Fazenda (farm). This land is located some 65 miles from the campus and borders on the Curu River. There are about 888 hectares (2200 acres) in the tract with some 120 hectares (300 acres) being along the river and available to irrigation from the main canal from the General Sampaio reservoir constructed upstream on the Curu.

Some Land is Marginal

Much of the remaining land area is rolling, rocky and brush-covered. There are many small valleys that may lend themselves to dry land research. However, their drainageways become water-logged during the six-month (more or less) rainy season, and thus pose challenges for profitable research study sites.

Presently, concentration on development of suitable land areas for research is confined largely to that portion which lies along the river. Some exploratory work is to be initiated during the coming year on a few of the upland sites to determine their possible potentials.

A topographical survey of the river land has just been completed and plans are in process for land forming operations, for renovation of the badly silted drainage system, for construction of service roads, and for repair of the water distribution canals.

Three sides of the Fazenda have been enclosed with a cattle, sheep and goat tight fence. The river side has yet to be closed but present thinking leans toward the planting of closely spaced bamboo intermixed with thorny bush.

Roadways Are Opened

Many of the old trails through the hills have been bulldozed out so that jeeps, trucks and farm tools can negotiate to those areas which may be potentially usable for dryland crops. Main service roadways have also received needed attention.

A meteorological station has been built and instrumented. Valuable climatic data for the area are being collected and recorded for the first time.

The university administration early appreciated that, since the new experimental station was to be located some distance from the campus and from the city of Fortaleza, and reached only by truck or jeep after travel over a not too good public road system, accommodations for sleeping and feeding must be provided for use of personnel engaged in research or otherwise using the fazenda for university work.

Consequently, one of the old original fazenda headquarters buildings has been completely renovated and remodeled into a most adequate structure. This building (a hotel) will take care of at least 10 to 12 people for whatever period of time required. Involved also in this development was the drilling of a new well and installation of a sewage disposal system.

New Buildings Started

In process of erection is a new complex of buildings to be used for administration and operation of the experimental fazenda. There is to be a structure for an office and general classroom auditorium, a repair garage and service building, a warehouse and two other buildings for storage of research field equipment and farm machinery. Also included in plans for the immediate future is purchase and erection of a dormitory facility for use by approximately 20 students while they are engaged in special problems or studies at the fazenda.

While the fazenda eventually will be serviced by high line electric power, a 220 volt, 15 KVA diesel-electric generator and distribution system has been installed for power for present operations. This unit will be retained for standby use in case of power outage.

Will Have Many Uses

Long-range plans for the experimental fazenda are continually developing. Eventually it is expected that the facility will provide adequately for research; for college and graduate course presentations; for community activities; for short courses; for demonstrations for extension work; and for such other uses of benefit to agricultural development in this Northeastern area.

Already many basic things are tak-

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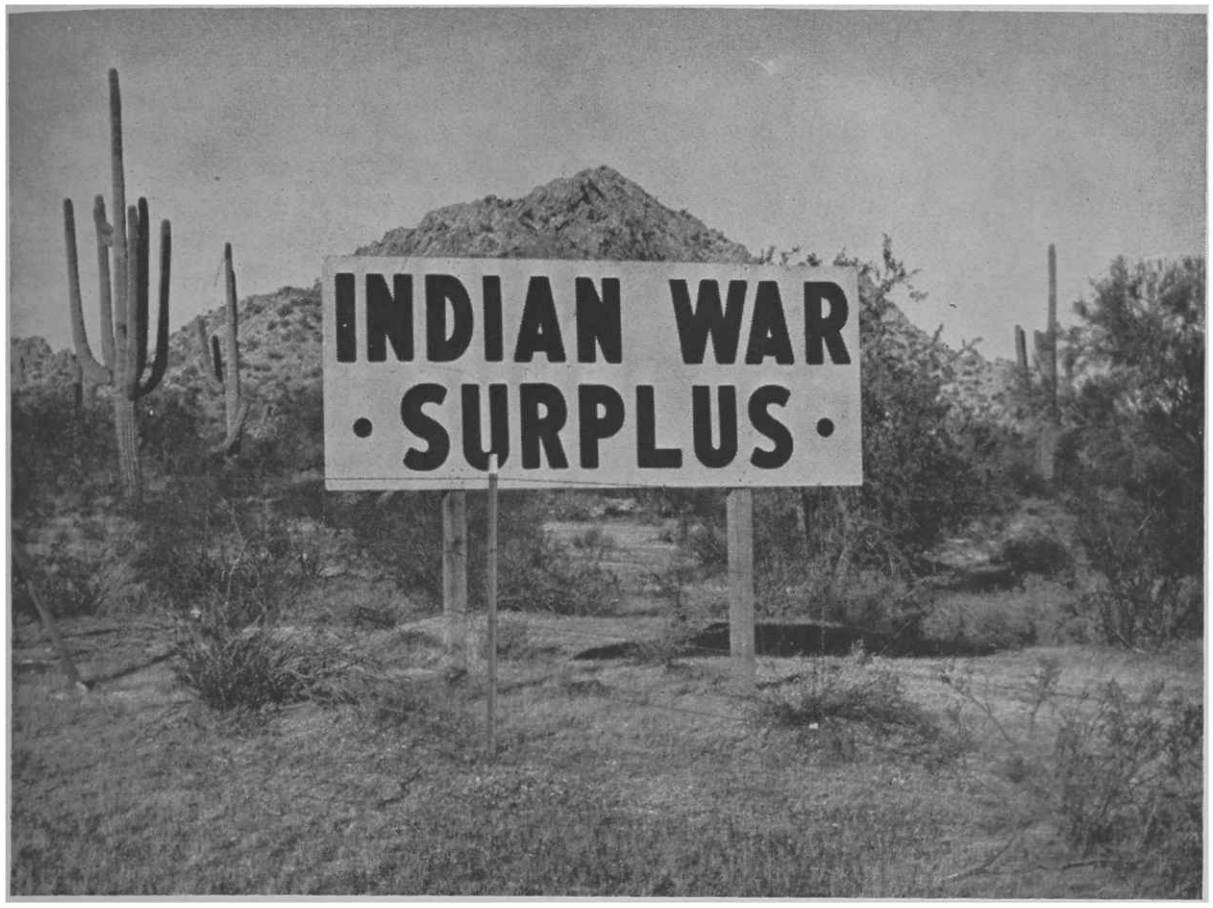
Dr. Reynolds is Research & Experiment Station Administrator with The University of Arizona team at the University of Ceará, located at Fortaleza in northeast Brazil.

Mystery Picture Has Aboriginal Tone

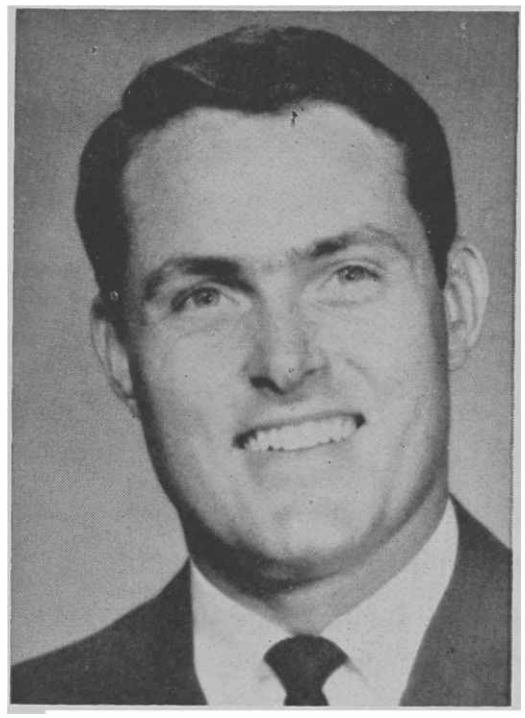


We don't know much about this picture — excepting that we snapped it between Casa Grande and Yuma.

It is one of a series of signs for one of those highway establishments which sell regional materials to the passing tourist — moccasins, beaded bags, cactus plants, baskets, belts, squaw dresses, cowboy boots and colored postal cards with their inevitable cattle, horses or burros.

Some day we'll stop by and find out what "Indian War Surplus" really means. Or perhaps it is better to conjure mental pictures of obsolete tomahawks and spears, rusty arrows, slack-strung bows, and K-ration cans of pemmican.

FFA Alumni Award Won By Ron Rayner, Goodyear



Ronald Rayner, farmer at Goodyear, was named to receive the 8th Annual FFA Alumni Award from the Arizona Association, Future Farmers of America. Purpose of the award is to pay tribute to former FFA members for outstanding accomplishments and leadership activities in their communities and state. A large engraved plaque was presented to Mr. Rayner, on behalf of the state FFA, by past state FFA President Richard Morrison. Over 500 FFA award winners, honorary state farmers, legislators and other friends of FFA witnessed the presentation during the 11th annual FFA Recognition Day luncheon at Phoenix.

DESDE EL PUNTO DE VISTA de la nutrición, el cuerpo de una vaca de raza de carne se afecta seriamente si está escaso el fósforo de la sangre, aunque sea por uno o dos meses. Este trastorno es seguro que se refleje de algún modo en la salud y comportamiento de la vaca o de su ternero o de ambos. El nivel de fósforo en las sangre ha de ser del 6.5% y para lograrlo conviene mezclar con la sal común de hueso cocido.

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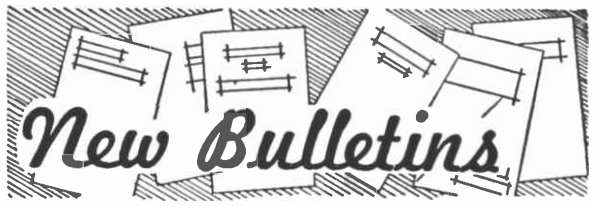
ing form. Many worthwhile exploratory trials and selection studies of field and horticultural crops have been conducted. Several superior and potentially valuable agricultural materials have been found. These are being increased for distribution to farmers and gardeners. Similarly, improved selections imported from other parts of Brazil, from other South American countries and from the United States are being carefully tried and critically examined for their potential use in dry northeast Brazil.



Bulletins

- A-46 Planting Cotton to a Stand
- A-47 Safflower Production in Arizona
- A-26 revised Protect the Cotton Plant from Insect Injury
- A-1 revised Chemical Weed Control Recommendations

Circulars

- 290 A Cook's Almanac for Altitude Problems
- 148 revised Fruit Insect Control Hints

AND NO THUMBS, EITHER!

How accurate can a weighing device be? The Wisconsin Department of Agriculture's weights and measures division found recently that a 175-ton railroad scale checked out 99.96 percent accurate. Readings were taken from 2,000 to 40,000 pounds and tickets printed with the results at 3,000 pound intervals. Zero errors were found at all readings excepting at the 20,000 and 40,000 pound weights, extreme end of the scale dial. There a graduation error of 20 pounds was found.

Folders

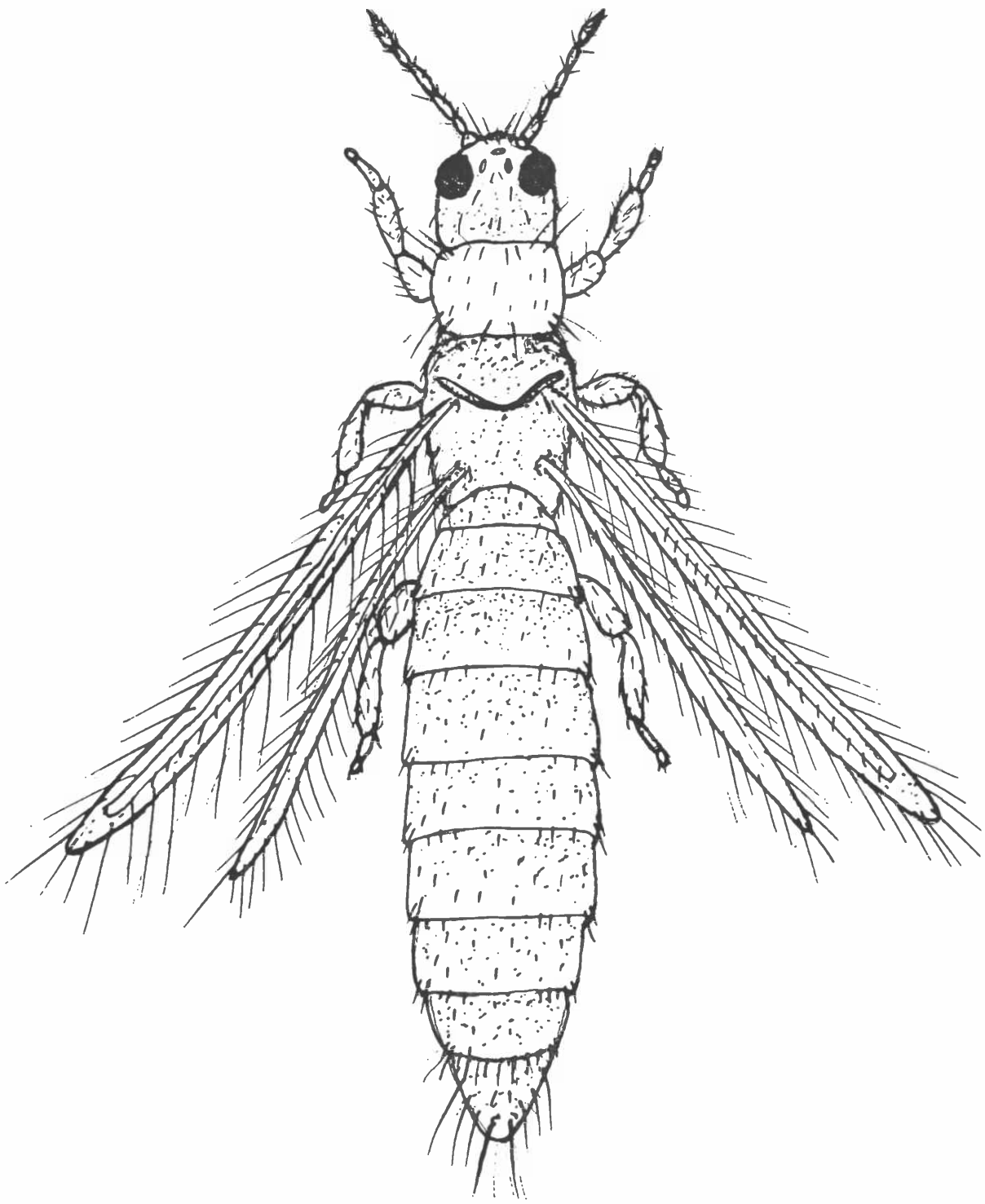
- 114 Sugar Beets: Insects
- 115 Sugar Beets: Mechanization
- 119 Methods of Sampling Feed for Laboratory Analysis
- 120 Why Rip that Levi Leg to Mend It?
- 121 Darning on a Simple Sewing Machine

THRIPS

Of Economic Importance in Arizona

By Donald M. Tuttle

Thrips are among the smallest insect pests of agricultural crops as well as ornamental plants. During the past few years some research has been carried out to determine our most common species and evaluate their damage to agriculture. Almost all cultivated crops are inhabited by these insects at one time or another.



Thrips are minute insects measuring from 0.5 to 5.0 mm. They are elongate (cigar shape) and usually have two pairs of fringed wings which are folded lengthwise and flat on the abdomen when they are at rest. Many species are shades of brown, whereas, others are yellow, black, purple, reddish, and some almost white. Antennae are usually short, with a varying number of segments. In most cases the legs are rather short. The mouthparts are a rasping-sucking type.

They Feed on Plants

Most of the thrips are plant feeders. A few are predaceous and others feed on fungus, frass of beetles, leafmold, and humus. Plant feeding thrips cause scars and blemishes on fruits and vegetables which turn silver or brown.

Thrips cause distortion of new leaves, silvering of others, defoliation, bud and flower injury, and some species as *Frankliniella* spread plant diseases.

Thrips have a simple life history. The minute, bean-shaped eggs are oviposited by the female in or on tender parts of the plant. These hatch into a nymph which feeds 7 to 10 days or longer on the plant. There are two nymphal stages before the prepupal or resting stage. The latter transform into pupae. During this period the adult stage is reached in 4 to 14 days. In a few cases reproduction occurs without mating. In some species males are unknown.

MOST WIDESPREAD in Arizona is the Western Flower Thrips, Frankliniella Occidentalis (Pergande) which does serious damage to cotton, cantaloups, melons, alfalfa, vegetable crops and flowers. ←

Most Common Species

FLOWER THRIPS: This group is the most abundant in Arizona as well as western United States and causes serious damage to a number of crop plants.

The western flower thrips, *Frankliniella occidentalis* (Perg.), is the most widespread. This and other species inhabit the flowering parts of the plant but move to other plant parts, doing serious damage. Seedling cotton plants are damaged during cool weather, especially in higher elevations of the state. Cantaloups, watermelons, alfalfa, vegetable crops and flowers have all been seriously injured by these flower thrips.

Ordinarily, they cause little damage to the buds and flowers which they inhabit. However, during the winter months considerable injury is

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done to the plant by the thrips feeding in the terminals.

The most serious damage results from their feeding on the underside of leaves of seedling cotton, beans and other young plants of vegetable and field crops. Seed crops of alfalfa, onions, lettuce, carrots, sugar beets and others are reduced by flower thrips.

GRASS THRIPS: Two species, *Chirothrips falsus* Priener and *Chirothrips mexicanus* D. L. Crawford are the principal pests of bermudagrass seed crops. The developing seed is attacked mainly by the nymphs. However, the adult thrips also do considerable feeding and damage. Growers apply three to five insecticide treatments to their fields each year to control thrips.

CITRUS THRIPS: *Scirtothrips citri* (Moulton). This species is a small yellowish thrips found mainly on citrus. It is active, and a stronger flier than many insects. The citrus thrips occurs only in California and Arizona and apparently prefers a hot dry climate. It has adapted itself to citrus, but also occurs on many shrubs and trees. Scarring or "ringing" of the citrus fruit occurs in the spring shortly after the fruit is set. Sometimes silvering appears on larger fruit, due to later attacks during the year. These thrips inhabit the terminals or new growth of citrus trees. The feeding by nymphs and adults on the developing and small leaves causes streaks of white or yellow in addition to curling and cupping of the new leaves.

ONION THRIPS: *Thrips tabaci* Lind. Onion thrips are similar to flower thrips in size and color. It occurs on a wide range of hosts in Arizona, including crop plants and native vegetation. Crops frequently damaged in Arizona are onions, carrots, cantaloups, lettuce, alfalfa, cucumbers and cotton. Silvering of foliage is common on plants attacked. Yields of seed crops are reduced, such as onions, lettuce, carrots and flower seeds.

BEAN THRIPS: *Hercothrips fasiatus* (Perg.) The adults are dark gray, with the front wings banded with two light and dark areas. Bean thrips occur on a number of plants and cause significant injury to many garden and field crops. Although this species feeds principally on the leaves of plants, it sometimes attacks fruit, resulting in silvering and discoloration. Most cases of crop injury are traceable to infestations from weeds and plants nearby.

GLADIOLUS THRIPS: *Taeniothrips simplex* Morison. Wherever gladiolus are grown, the foliage and flowers are severely injured by this pest. The adults are dark brown and the nymphs yellowish. Initial injury occurs on the leaves and spikes, resulting in a spotted or bleached appearance. Damaged flower buds fail to open properly and the colored petals are blotched with white. In some cases flower damage is extensive and the blooms are worthless. Further injury takes place in storage to the corms. Feeding on the corms results in scabby leisons and a reduction in vitality.

Beneficial Aspects

The banded-winged thrips (*Aeolothrips*) occur occasionally. These thrips are predators of plant-feeding thrips, mites and other small insects. Most of the species appear to be specific to plants and prey as well as in seasonal occurrence.

Species belonging to *Scolothrips* are also predaceous on mites and small insects. The best known is the six-spotted thrips, *S. sexmaculatus* which is found on many plants. It is particularly effective against spider mites.

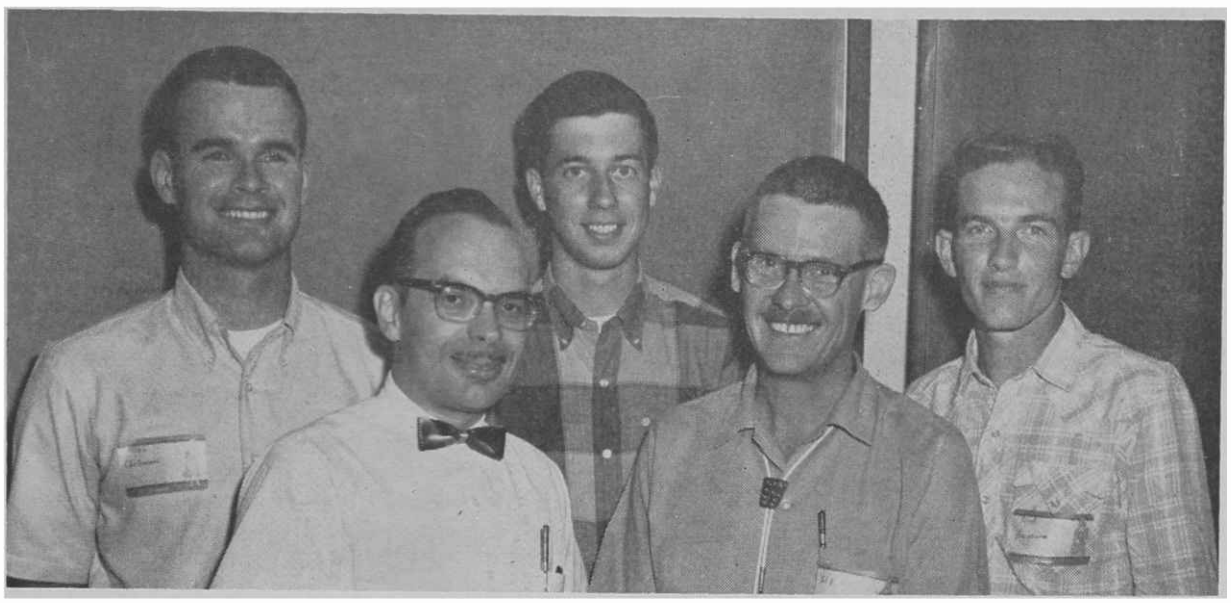
Suggested Control Methods

It is often necessary to use chemical insecticides for the control of thrips on agricultural crops. Materials currently used are: DDT, dieldrin, malathion, diazinon, sulfur, sabidilla, dimethoate, Bidrin, toxaphene, dioxathion, naled, parathion, Trithion, and mevinphos. The materials and their use for specific crops are cited in Arizona Insect Control Recommendations, Bulletin A-14, Cooperative Extension Service and Agricultural Experiment Station, University of Arizona.

For the home garden and ornamentals, some of the same materials may be used. However, only those which are less toxic or hazardous are suggested. These include: sulfur, sabidilla, malathion, dieldrin, diazinon, and DDT. In all cases the label will suggest the rates and give precautions. Follow these instructions exactly, and refer to Bulletin A-14 in case of edible crops.

Dr. Tuttle is an Associate Entomologist, stationed at the Yuma Branch Experiment Station.

Crops & Soils Club Officers, Advisers



Special "interest groups" organized in a score or more of clubs give added interest to students and faculty members in this College of Agriculture. Whether your pet hobby is bugs or bees, cattle or cotton, range improvement or roping, this college has a club where you can join others with like interests.

Typical is the Crops & Soils Club, whose officers for 1965-66 are shown here. In the back row, left to right, are Mike Chrisman, Visalia, Calif., president; John Hart, Rochester, N.Y., secretary-treasurer, and Fred Amator, Tolleson, Ariz., vice president. In the front row are the faculty advisers, Dr. Thomas H. McIntosh of Agricultural Chemistry & Soils, and Dr. William R. Kneebone, Agronomy Department.

The Crops & Soils Club is affiliated with the student section of the American Society of Agronomy. At frequent meetings of the club the members hear speakers from various fields of crop production. The club also sponsors an annual cotton picking contest, and raises money by growing colorful Indian corn and ornamental sorghums to be sold for novelty decorations. With funds received, members pay their way to meetings of the American Society of Agronomy.

There are numerous methods of obtaining additional water, ranging from paving the desert to sea water conversion. To date, all of these methods have been too expensive for irrigation agriculture. Experiments conducted this Spring at The University of Arizona indicate that treatment of watersheds with common table salt may provide additional water at a price low enough for irrigation.

USING SALT TO INCREASE IRRIGATION WATER

By C. Brent Cluff and Gordon R. Dutt

Although most reservoirs in Arizona are nearly full now, this has not been the case for the last 25 years.

Because of the important need for more water, considerable research has been done in Arizona in vegetative manipulation to reduce evapotranspiration loss and thus increase streamflow. It has been estimated that Arizona harvests only 4 to 5 percent of its annual precipitation for beneficial use. Most of the precipitation that falls on the state is returned directly to the atmosphere in the form of evaporation.

"Pave" to Save

In addition to modifying the vegetation density to increase streamflow, considerable research has been done in developing materials to "pave" watersheds. Although these methods are relatively expensive (in excess of $300 per acre) they are designed to catch nearly 100 percent of the precipitation. Currently this type of "paved watershed" is being used primarily as a source of stock water supply.

Soil scientists have long known that sodium greatly affects the rate of movement of water into and through soils. Indeed, the criteria for determining the suitability of water for irrigation, and analyses of irrigated soils, consider the sodium content as one of the principal factors. One of the main reasons for this interest is that in soils with a high sodium content, the rate of intake of water is so slow that the depth of penetration is limited.

Thus, sodium salts are considered detrimental to irrigated soils. In watershed areas, however, this may not be the case. Sodium salts may well give us a practical way to increase runoff from watersheds, and to develop areas which are now relatively non-beneficial.

Salt, Clay Work Together

If water is to run off, rather than infiltrate into the soil, then the intake rate of water through the surface must be lowered. An effective way to do this is by increasing the exchangeable sodium concentration in the soil. This can be accomplished by applying common table salt, sodium chloride, to the surface. When it rains, the salt on the surface will go into solution and interact with the clays that are present.

When the salt content of water is high, there is a high initial infiltration rate. Thus, the salt in solution moves into the soil. At this point the sodium adsorbed on the clays has been greatly increased. Now, as additional salt-free rain water enters the soil, the sodium adsorbed on the clays remain, but the concentration of the salts in the soil solution becomes low. The clays become highly dispersed and block the water-conducting channels present in the soil. Therefore, the infiltration rate is drastically cut. In that way less water enters the soil and runoff is increased.

After the rainfall, evapotranspiration processes produce moisture gradients which move the water and salt in the soil towards the surface. Therefore, a cycle has been completed. This cycle would be repeated following additional rainfall.

To Test a Theory

In order to test the sodium salt treatment in Arizona, 10 pans were filled with three different soil types and subjected to normal rainfall. Results of the first storm following treatment are shown pictorially in the photo at bottom of this page. Pans 1, 3 and 5 were treated to attain a 15 percent exchangeable sodium percentage in the surface inch of soil. This is the threshold concentration for classification of alkali soils. The

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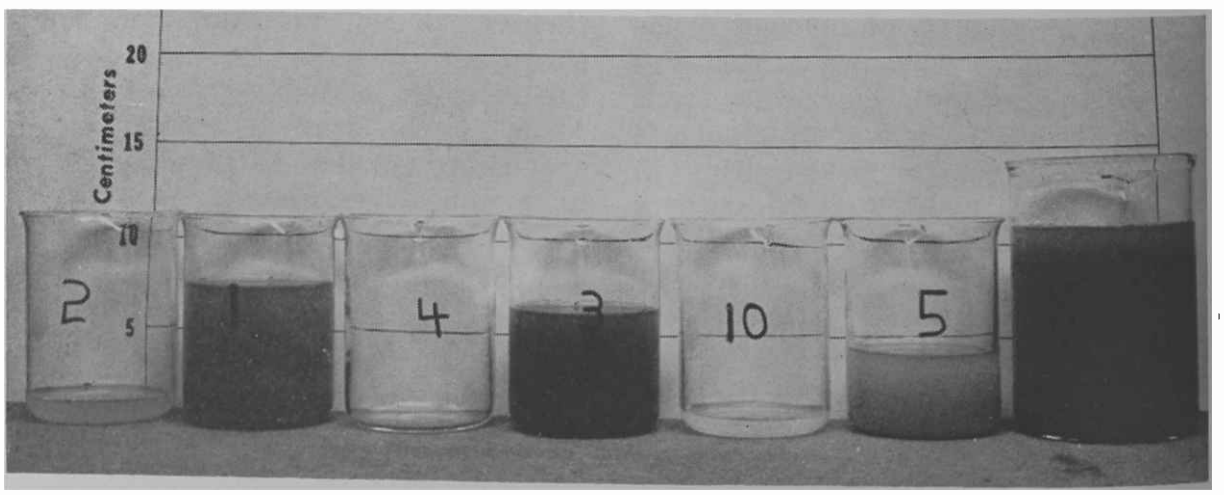
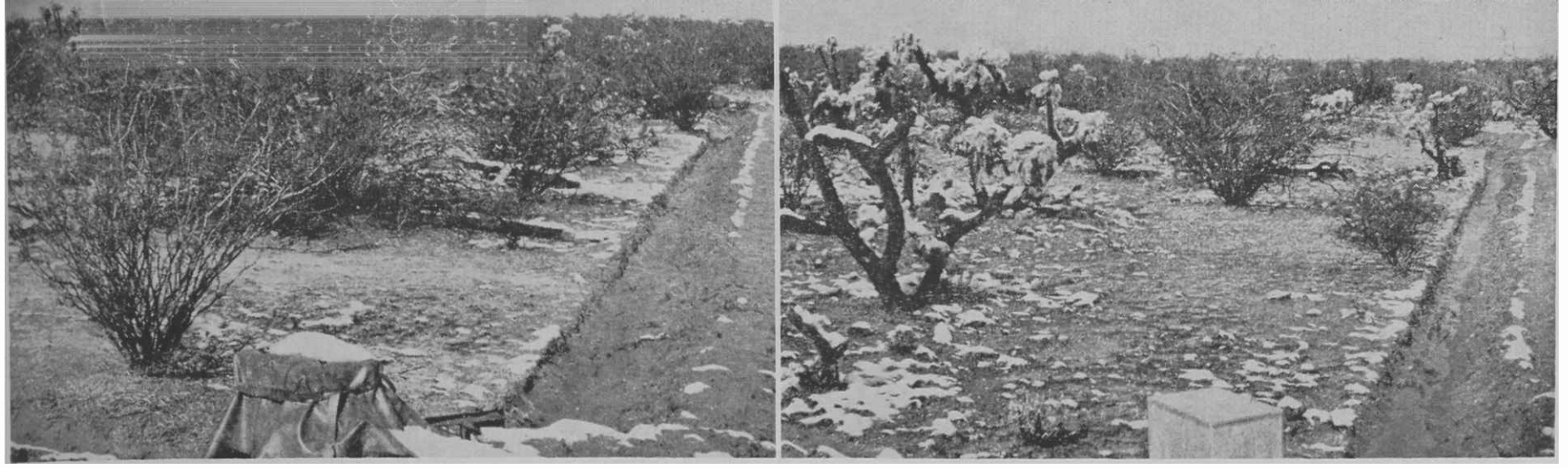
WATER YIELD from pans after a 0.39 inch winter rainfall. Runoff in pans 2, 4 and 10 — almost none at all — came from the untreated soils. Pans 1, 3, 5 and 8 (numbers obscured because of turgidity of water, but still indicating substantial quantities) came from the treated soils.



Mr. Cluff is an Assistant Hydrologist at the Institute of Water Utilization and Dr. Dutt is an Associate Professor in the Dept. of Agricultural Chemistry and Soils, both in this college.

The authors gratefully acknowledge the help and cooperation received from Dr. W. D. Kemper of Colorado State University, who was the first to demonstrate on small pans that the characteristic reduction of infiltration due to sodium salts might be helpful in increasing runoff.



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treatment rate in Pan 8 was doubled to achieve a higher sodium percentage. Water yields ranged from none on the untreated soil in Pan 4 to 49 percent water yield from the treated soil in Pan 8.

Following these significant results, two one-acre plots on the Atterbury Experimental Watershed, located on the valley floor east of Tucson, were selected. A border was placed around each of these plots which confined the runoff so that it could be measured. Otherwise the plots were undisturbed. One plot was used as a control, while the other acre plot was treated with sodium chloride. Treatment was made in January, 1966 with a cyclone seeder, as shown at the right.

Following treatment, a total of 2.90 inches of precipitation was received in seven storms, including 0.40″ which occurred in the form of snow. The photos at the top of this page show visual evidence of the effect of the sodium treatment in reducing the infiltration rate. These pictures were taken when the snow was melting. Note that there was no visible surface water from the melting snow on the control plot, but there was substantial surface water on the treated plot. Of the 2.90 inches of precipitation, 10.3 percent has been measured as runoff from the treated plot compared to less than 0.4 percent water on the control. *The sodium chloride treatment increased runoff about 25 times.*

The quality of water coming off the treated plot is remarkably good. As indicated earlier, the added salt moves into the soil and is not present in the runoff water. For all runoff trials, water from the treated plot contained less than 200 parts per million dissolved salts. This may be compared with the salt content of the lower Colorado River which contains from 800 to 1000 ppm.

Cost Seems Moderate

As far as economics are concerned, the cost of a treatment of large areas with sodium chloride, including aerial application, has been estimated to range from $6 to $12 per acre, depending on the amount of salt required. For a given watershed, the effective life of this treatment and the water yield would vary according to the soil, rate of salt applied and the amount and rate of precipitation.

For the three soils tested, it appears that the initial treatment should last several years. Subsequent treatments would be at a lower rate. In an area with an 11-inch annual rainfall, it appears that the treatment would increase water yield by 1 to 2 inches per year. This compares with a 1.8 inch annual water yield from the Salt River Watershed, which has an average annual precipitation of 18 inches.

Right now there are too many unknown variables to make a prediction of the exact cost of producing additional irrigation water using sodium chloride. However, preliminary results and the theory involved indicate that it should be possible to stay within the economic limitations of irrigated agriculture, particularly in areas where the rainfall exceeds 12 inches per year.

Before treating large areas to provide irrigation water, additional research must determine the best treatment rate for various conditions. Sufficient salt should be applied to increase runoff without destroying the perennial vegetation. Steep slopes would be treated with less salt to avoid excessive erosion.

Meanwhile, we have sufficient data on smaller areas to recommend sodium treatment to provide water for livestock.

ABOVE, LEFT, untreated plot during the snow melt. Note little snow on the surface and no water in the ditch. At right, the treated plot, with snow and surface water, as well as considerable water in the ditch.

USING A PLAIN litle cyclone seeder, such as is sometimes used for spreading grass seed, C. Brent Cluff "seeds" plain table salt on the test plot.

Agua Fria Is Winner In State FFA Contests

Agua Fria Union High School at Avondale won the sweepstakes plaque in statewide competition during the Future Farmers of America Field Day March 19 at The University of Arizona.

To win, Agua Fria teams racked up the highest total score in a minimum of six contests testing their agricultural skills.

Some 850 FFA boys took part in the field day on The U of A campus and at nearby U of A experimental farms.

Contests included poultry judging, agricultural engineering, livestock, dairy cattle, meats, soils, agricultural economics, agronomy, horticulture, range management, and entomology.

Douglas High School won second place. Willcox High School, Washington High School at Glendale, Tempe Union High School, and Amphitheater High School in Tucson won honorable mention for winning third, fourth, fifth, and sixth places, respectively.

Testing Plants For Prussic Acid

By Dr. Raymond Reed

It's fairly common knowledge that certain plants used as livestock feed may at times contain poisonous amounts of hydrocyanic (prussic) acid. The question of how much, if any, HCN is present in a forage at any particular time and under a variety of circumstances can best be answered by performing a test for the material.

A very simple and usually very effective test has been available for many years. D. W. Steyn in the 1934 edition of "Toxicology of Plants in South Africa," S. African Agricultural Series, Volumn XIII, credits a 1926 publication of Henrici with the following method for preparing the reagent and performing the test:

Alkaline picrate solution consists of sodium carbonate, 5 gm. and 0.5 gm. picric acid in 100 ml. water. Ordinary filter paper strips 1 cm. x 4 cm. are wet with this and used when just perceptibly moist. Freshly prepared papers should be used.

Into a test tube place a few grams of moist shredded plant. Add enough chloroform to hasten hydrolysis, insert a slip of the "perceptibly moist picrate paper" at the top and cork tightly. Incubate in the shirt pocket, examining at intervals. Liberation of HCN is indicated by reddening of the yellow picrate paper — within a few minutes if the amount is large; after 24 hours if only traces are present. If the paper remains lemon-yellow it means either that a cyanogenetic glycoside is absent or that a hydrolytic enzyme is not intimately associated with it.

The alkaline picrate solution keeps indefinitely. With this reagent, some chloroform, a test tube and a supply of filter paper strips, anyone can test plant tissues for the presence of hydrocyanic acid. One cautionary statement is needed, however. If plants containing toxic levels of prussic acid are present in a field but these are missed in the sample selected, a false negative test will result.

Dr. Reed is head of the Department of Animal Pathology.

The Wiles and Ways of

PRUSSIC ACID POISONING

By Barry N. Freeman

The finest of forage plants (grasses, legumes and browse) are periodically killers in disguise. Their lethal weapon is cyanide, commonly called prussic acid. It is only under such variable conditions as climatic change, season of year, fertilization, the stage of growth, etc; that such plants undergo a physiological change that converts the productive, nutritious Dr. Jekyll plant into a plant with the lethal potentials of a Mr. Hyde! Just such a plant is our old friend and foe — Johnson grass!

Johnson grass, *Sorghum halepense*, is a tall growing perennial (3 to 6 feet), with underground rootstalks. These underground rootstalks make it a real problem in cultivated cropland areas. It is also an excellent erosion control plant and it is relished by livestock having access to it. Under normal growing conditions, Johnson grass produces an abundance of palatable, nutritious forage.

But often when the plant is subjected to conditions that inhibit or accelerate its growth, such as frost, drought or regrowth following drought, there is a physiological change in the plant that may activate the enzyme that is involved in cyanide release. Johnson grass contains the cyanogenetic glycoside — dhurrin which is the toxic principle. This same glycoside is present in varying amounts in sorghums, sudan grass, and *Sorghum almum.*

Apparently, there is a genetically associated cyanide potential for various plants — sudan grass is low; Johnson grass is intermediate, and *Sor-*

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Mr. Freeman is Extension Specialist in Watershed Management.

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ghum almum and various sorghums are high. Cyanide potential indicates the amount of nitrile glycoside in the plant. Young plants tend to have the higher HCN potential. The cyanide content of the plant drops rapidly following pollination. Low phosphorus content in the soil, coupled with high available nitrogen, tends to increase the HCN potential of a plant.

How Much is Dangerous?

What is the danger-level of cyanide potential in a plant? When the level is in excess of 0.02 per cent, the caution flag should be waved! Cyanide potential in some forage sorghums may reach as high as 0.34 per cent. As little as half a pound of forage at this level might prove fatal. Sudan grass generally has one-third to one-tenth the cyanide potential of the average forage sorghums. *Sorghum almum* was found to have 0.1 per cent cyanide, making it high in potential.

How does a cyanogenetic (nitrile) glycoside affect an animal? In other words, what is the killing technique? Hydrolysis, brought about by enzymatic action in the plant or animal, yields hydrocyanic acid (HCN). The HCN is absorbed into the blood stream and, by inhibiting certain enzyme action that interferes with the linking of atmospheric oxygen and metabolic respiration, the poisoning in effect is asphyxiation at the cellular level.

Does haying or ensiling forage plants with HCN potential (Johnson grass, sudan grass etc.), reduce the poisoning potential? During the curing process in making hay a degree of the cyanide potential is lost. Complete drying inactivates the enzyme responsible in cyanide release. No cases of mortality have been reported from the consumption of sorghum silage. The glycoside breakdown is complete during the ensiling process, producing free HCN which is rapidly lost to the air.

Symptoms of a cyanide or prussic acid poisoned animal include uneasiness, staggering and falling, gasping, difficulty in breathing. The eyes may roll and the tongue hang out; prostration, convulsions, coma, bloating and death. Because prussic acid poisoning is generally so rapid, treatment of animals is generally not practical.

In Many Plants

Plants other than the *Sorghum* genus which commonly cause prussic acid poisoning under range and pasture conditions in Arizona include: catclaw (*Acacia greggii*), white thorn (*Acacia constricta*), mountain mahogany (*Cercocarpus spp.*), choke-cherry (*Prunus spp.*), white clover (*Trifolium repens*), and arrowgrass (*Triglochin spp.*).

Generally, prussic acid poisoning most often occurs in the fall of the year when there are great fluctuations in temperature and growing conditions. A livestock man having cyanide potential plants among his forage plants should be particularly observant of such pasture areas during the fall of the year.

Recent Journal Articles Listed

EDITOR'S NOTE: In addition to the various "popular" publications of this College of Agriculture — Extension folders, Extension bulletins, 4-H materials, the popular bulletin series, technical bulletins and others — staff members submit a prodigious output of material to the scientific journals in a score or more fields of scientific inquiry. A listing of recent titles will be given in each issue of PROGRESSIVE AGRICULTURE IN ARIZONA, starting now. Readers who may wish copies of certain papers should write directly to the authors. The listing below includes Journal Number, title of the paper, authors, and journal to which the article was submitted.

947 "Extension-Research Cooperation in Evaluation Studies to Determine Feasibility of Climate Control."
by W. T. Welchert and Frank Wiersma
Agricultural Engineering

948 "Estimating Rapidity of Germination"
by Henry Tucker and L. Neal Wright
Crop Science Journal

949 "Physiological Relationships in an Apical Dominance-Like Ear Pattern in Corn. I. Growth, Ascorbic Acid, and Enzyme Activity."
by Robert H. Maier and Joseph F. Irwin
Physiologia Plantarum

950 "Bermudagrass—Worldly, Wily, Wonderful Weed"
by William R. Kneebone
Economic Botany

951 "Further Observations on the Digestion of Milo and Barley by Steers and Lambs"
by E. K. Keating, W. J. Saba, W. H. Hale and Bruce Taylor
Journal of Animal Science

952 "Factors Affecting Rate of Dry Matter Production and Agronomic Yield of Cotton and Other Species."
by J. H. Hesketh and M. El-Sharkawy
Invitational Paper Cotton Defoliation and Physiology Conference, Atlanta, Georgia.

953 "*Encarsia lutea* as an Egg Parasite of Bollworm and Cabbage Looper in Arizona Cotton.
by Adair Stoner and George D. Butler, Jr.
Journal of Economic Entomology

954 "The Use of Diazinon and Fertilizers for Reducing Bermudagrass Mite Damage and Promoting Grass Growth."
by G. D. Butler, Jr. and J. L. Stroehlein
Journal of Economic Entomology

955 "Effect of the Addition of Cottonseed Lipids to Cottonseed Meal on Egg Discoloration."
by A. R. Kemmerer and B. W. Heywang
Poultry Science

956 "Use of Liquid and Solid Forms of Nitrogen Fertilizers for the Decomposition of Crop Residues."
by J. L. Stroehlein, L. B. Fenn, and W. H. Fuller
Soil Science Society of America Proceedings

957 "A Study of Necrotic Lesion Formation by Tobacco Mosaic Virus."
by C. L. Parish, Milton Zaitlin and Albert Siegel
Journal of Virology

958 "Additional Information on Chromosomal Structural Changes in Gossypium."
by J. E. Endrizzi
Journal of Heredity

959 "Determination of Ferric and Other Metal Chelates of Ethylenediamine di(o-hydroxyphenylacetic Acid) in Plant Tissue."
by T. W. McCreary and R. H. Maier
Biochemical and Biophysical Research Communications

960 "M.S. 3413 Ent. Res. Div., U. S. Dept. of Agriculture Evaluation of Chemicals as Honey Bee Attractants and Repellents."
A. W. Woodrow, ENT; Nathan Green, ENT; H. Tucker, Numerical Analysis Lab., U of A; M. H. Schonhorst and K. C. Hamilton, Ariz. Agric. Experiment Station
Journal of Economic Entomology

961 "The Reactions of 1,2-Dioctylcyclopropene with Silver Nitrate."
by Henry W. Kircher
Journal of the American Oil Chemists' Society

962 "Biological notes on *Megachile Concinna* Smith in Arizona.
by George D. Butler, Jr. and Philip L. Ritchie, Jr.
Pan-Pacific Entomologist

963 "New Species and Nomenclatural Changes in *Cienfuegosia* Cav."
by Paul A. Fryxell
Brittonia

964 "Heritability Estimates and the Genetic Correlation of Water Consumption of Rats at Two Environmental Temperatures."
by C. B. Roubicek, H. Tucker and R. O. Kuehl
Genetics

965 "Movement of the Hawaiian Monk Seal on Laysan Island."
by G. D. Butler, Jr. and

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M. D. F. Udvardy
Journal of Wildlife Management. Pacific Science

966 "Limitations to Photosynthesis Among Species."
by M. El-Sharkawy, J. Hesketh, and H. Muramoto
Paper to be presented at 41st annual meeting, Southwestern and Rocky Mountain Division American Association for the Advancement of Science, Annual meeting Arizona Academy of Science

967 "Observations on the Nesting Site and Biology of the Arizona Damp-Wood Termite *Zootermopsis laticeps* (Banks) (Hodotermitidae)"
by W. L. Nutting
Psyche

968 "A Self-contained Thin-Layer Chromatographic Chamber."
by Daniel W. Vomhof and Thomas C. Tucker
Chemist-Analyst

969 "A Method of Periodically Measuring Root Growth Rates of Germinating Sorghum Seed."
by Edouard A. Thompson and Robert L. Voigt
Crop Science (Brief Article)

970 "Effects of Honey Bee Activity and Cages on Attributes of Thin-Hull and Normal Safflower Lines."
by D. D. Rubis, M. D. Levin and S. E. McGregor
Crop Science

971 "Comparison of Performance of Layers Fed Soybean, Glandless or Glanded Cottonseed Meals."
by Burt W. Heywang and M. G. Vavich
Poultry Science

972 "The Gradient Balance Method for Specific Gravity Determination in Milk."
by J. W. Stull and A. M. Ohlander
Journal of Milk and Food Technology

973 "Native Bees Associated with Safflower in South Central Arizona."
by George D. Butler, Jr., Floyd G. Werner, and Marshall D. Levin
Journal Kansas Entomological Society

974 "Charcoal Rot Induction and Development in the Field in Arizona."
by L. K. Edmunds, R. L. Voigt and F. M. Carasso
Proceedings of Fourth Biennial Grain Sorghum Research and Utilization Conference, Amarillo, Texas.

975 "Biosynthesis of Cyclopropene Fatty Acids."
by Henry W. Kircher and Burt W. Heywang
Journal of Food and Agricultural Chemistry

976 "Biological Nitrogen Fixation."
by Henry Mayland and Thomas McIntosh
Nature (London)

977 "Composition of Defective TMV Protein."
by Milton Zaitlin and W. F. McCaughey
Virology

978 "Balanced Tertiary Trisomics in Barley."
by R. T. Ramage
Agricultural Science Review

979 "The Effects of Gibberellin on the Coleoptile of Maize."
by Mac D. Homan and R. M. Harris
Journal of the Arizona Academy of Science

980 "Sediment Removal from Flood Water by Grass Filtration."
by L. G. Wilson
Agricultural Engineering or Transactions, Agricultural Engineering

981 "Effect of Maturity, Storage Temperature, and Prestorage Treatment on Storage Quality of Valencia Oranges."
by R. A. Khalifah and J. R. Kuykendall
Proceedings of the American Society for Horticultural Science

982 "Systemic Insecticide TEMIK Promising for Control of Psyllids and Aphids on Potatoes."
by Dr. Paul D. Gerhardt
Journal of Economic Entomology (Scientific Note)

983 "Effect of Cottonseed Oil on Egg Hatchability."
A. R. Kemmerer, B. W. Heywang, M. G. Vavich and E. T. Sheehan
Poultry Science

984 "Root Griafting in *Quercus turbinella* Greene."
by Richard E. Saunier and Robert F. Wagle
Ecology

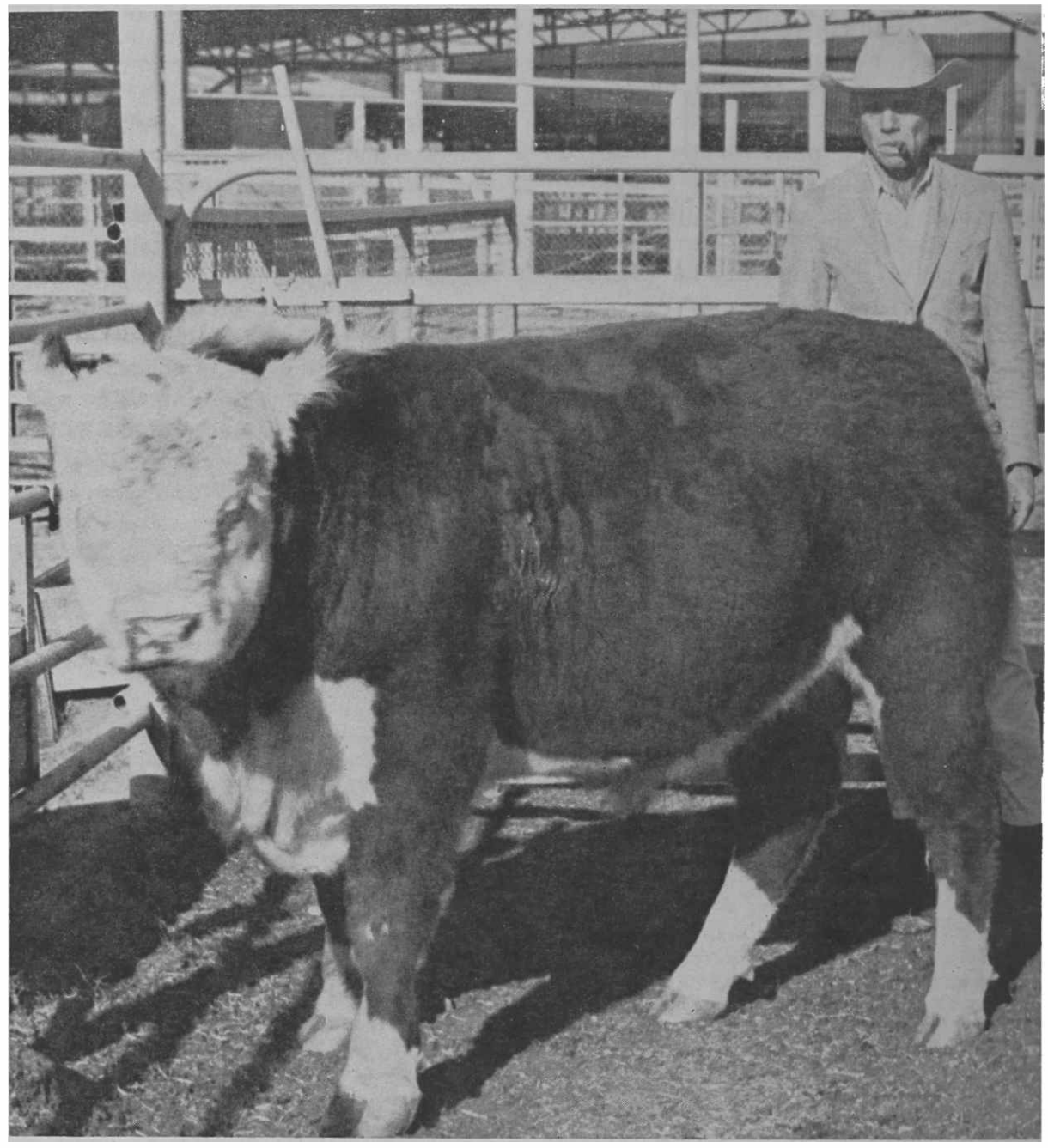
985 "Micro-Climate Modification For Hot Weather Stress Relief in Dairy Cattle."
by Frank Wiersma and Gerald H. Stott
Agricultural Engineering or Transaction ASAE

986 "Bromide and Fluoride Toxicities in the Chick."
by Doberenz, A. R., A. A. Kurnick, B. J. Hulett and B. L. Reid
Poultry Science

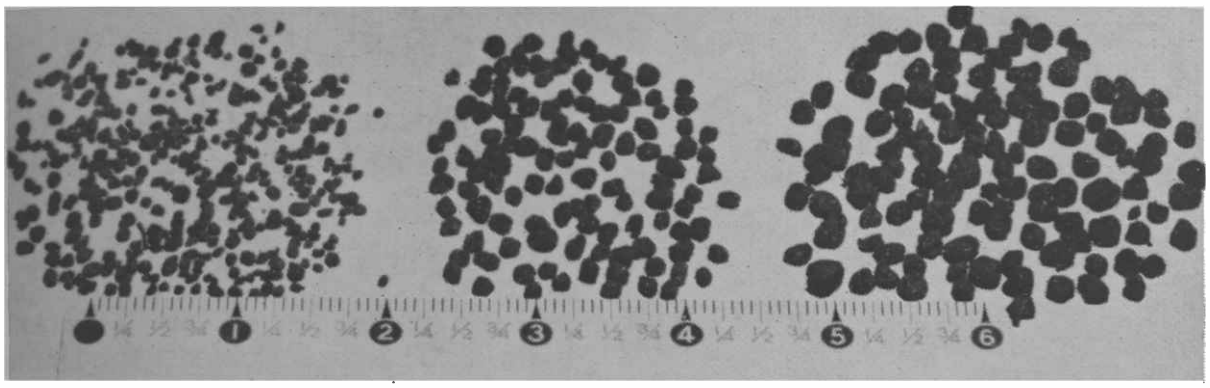
987 "Thermal Environments Under Synthetic Strip Mulches."
by M. D. Cannon
Transactions American Society of Agricultural Engineers

988 "Effect of Soil Moisture on Boll and Fiber Properties of Irrigated Cotton at Mesa and Tempe, Arizona."
by Leonard J. Erie, Orrin F. French and Lloyd Patterson
ARS 41 Series

Arizona Bull Goes to Buyer in Hawaii



Ernest Gray of Hana, Maui, Hawaii, bought this bull for $800 in The University of Arizona sale of tested bulls. In the picture is the breeder who sold the animal, Don Burnett of R. F. Burnett & Sons Ranch, Elfrida. This bull, GL Rolle Domestic, was one of the top grading bulls in the test, gaining 2.81 pounds per day for the 130-day test period.



EVERYTHING THESE DAYS, it seems, is either pelleted or put up in aerosol cans. Here is composted garden fertilizer pelleted for ease of handling and use. Inch rule indicates size. Each size is packaged separately.

Pelleted Compost Now Turns Former Waste Into Useful Product

By Wallace H. Fuller

Something new and quite revolutionary has happened to compost. It is now made commercially and it is pelleted in various sizes for cleanliness and easy use by the home gardener.

Recent population expansion has placed such high priority on space that the "old compost pile" has virtually disappeared from the backyards of America. Furthermore, this population expansion is greatly increasing the amount of municipal waste.

A serious disposal problem has developed. The waste is overburdening antiquated disposal systems. Fortunately, new disposal systems have been developed whereby municipal refuse or waste can be reclaimed and excellent compost made of the perishable material.

Valuable Resource Wasted

Compost is one of the valuable resources available to man as a by-product of municipal waste disposal. Compost *materials* have been dissipated along with our natural resources of water, timber and minerals by our modern civilization. Although this waste has been ignored in the United States and certain other countries, a realization of the advantages of composting city refuse is carried on in many foreign countries. The Netherlands, for example, composts over 30 percent of all city refuse.

Composting of municipal refuse is generally considered by the researcher in the field of waste disposal not only to be technically feasible, but also essential to the health and welfare of society. Some of the advantages of composting municipal refuse are:

1. Provides a new and more sanitary and effective method of refuse disposal.

2. Supplies a source of organic matter for maintaining and building seriously depleted supplies of humus in soils.

3. Improves the growth and vigor of crops and home garden plants.

4. Reclaims certain valuable materials.

Kills Undesirable Components

Compost, as shown in the pellet form in the picture, is prepared in a biodigester at elevated temperatures by an aerobic microbal decomposition process. The pathogenic bacteria and fungi are killed by the heat digestion. Weed seeds, insects and insect eggs are destroyed. The purified compost is then windrowed, and allowed to continue to compost in a pile, just as was done in the home compost pile. It is then screened and made into pellets or left "as is" for certain bulk use.

The municipal compost has very important advantages over other organic materials used for maintaining soil humus and improving plant growth. These are:

1. It is low in harmful salts.

2. It is low in total salts.

3. It is free from plant diseases and pathogenic organisms harmful to man and animal.

4. It is free of weed seeds.

5. It is free of excessive dust.

6. It is higher in certain plant nutrients than most organic soil conditioners.

7. It does not contain objectional odors. .

The pelleted compost has additional advantages over and above those just listed. Some of these are:

1. Pellets are convenient and easy to handle.

2. Pellets are cleaner to handle and cleaner around the private home after applying.

3. Pellets are practically odorless.

4. Pellets will not blow away as readily by wind action.

5. A choice of different size pellets may be selected for specific purposes to suit the fancy of the gardener.

The fine granular size moves down through turf grass until it contacts the soil because of its relative heavy density and small size, while the larger pellets are ideal for flower beds and mulching.

Dr. Fuller is head of the Department of Agricultural Chemistry and Soils.

DESTRUCTION OF INSECT PESTS

Total population control of insects has recently been proposed by U.S. Department of Agriculture entomologist Edward F. Knipling.

He says the program would not be cheap or easy. But the cost would prove substantially less than the annual cost of today's partial control plus the losses that occur despite control efforts.

Total population control would combine newly developed techniques to eliminate populations of some of the most destructive insect species and to prevent reinfestation if necessary.

Among the pests that need control measures are boll weevils, corn earworms, tobacco hornworms, tobacco budworms, cabbage loopers, sugarcane borers, European corn borers, pink bollworms, tropical fruit flies, cattle grubs, and face flies.

Insecticides, sterile insects, attractants, predators, parasites, cultural practices, and other control methods could be integrated into a number of programs, each designed to regulate a specific insect population.

OLD ALFALFA SEED STILL GROWS

Fifty year old alfalfa seed can still germinate and produce healthy sprouts, says O. W. Stevens, emeritus professor of botany at North Dakota State University. Dr. Stevens recently germinated alfalfa seed originally harvested in 1913.

RAISING A CHILD EXPENSIVE TASK

By Bessie J. Ruley

Parents are very much aware of the fact that children are not inexpensive additions to the family. As the cost of living has gone up, so has the cost of raising a child. The amount of research in this area, however, has not by any means paralleled the generally recognized rising costs.

Estimates of what a family would have to pay at today's prices to bring up a child from birth to 18 range widely, depending on family income, number of children, unanticipated financial demands, spending habits, and the location of the family. But even with these variables, it is possible to get a fairly reliable idea of what Mom and Dad would have to spend during the first 18 years of their child's life.

Expensive Even Years Ago

One of the first studies published on the cost of rearing a child appeared in the Monthly Labor Review of 1926. This study estimated that for a family with an average income then of $2500, the cost of rearing a child to age 18 would exceed $7238. Later, in 1946, Dublin and Lotka in a revised report of this study, indicated that the approximate cost of rearing a boy was $7823 and the cost of rearing a girl was $7710.

Calculating the cost of rearing a child today would be a relatively simple matter if the item expenses of these earlier studies could be multiplied by an index figure which would make the adjustment for changes in the value of the dollar between 1936 and 1965.

Several factors, however, make this approach unrealistic. Average income has changed, patterns of spending change with increased income, and the average size of the family has decreased from five persons in 1936 to slightly less than four persons in 1964.

In addition, there is today a wide variety of products available on the market which are more complex than, or entirely different from, the items of 30 or even 10 years ago. The results of these and other changes is a higher standard of consumption for the American family, which makes an accurate comparison with the family of 30 years ago difficult.

Spending Habits Change

Buying habits of the American public continue to change. Buying trends reported in U. S. News and World Report in 1961 showed less interest in new cars and household appliances each year, greater emphasis on a college education, and change in the recreational pursuits for which Americans were spending money. A Monthly Labor Review in 1960 reported that large family buying appears to reflect a trend to greater expenditures for teenage and near-teenage children in 1950 as compared with the mid-30's and early 1940's.

Popular magazines have periodically published estimates of costs involved in raising children. Such estimates range from $25,000 in 1956, $22,000 in 1964, and $28,000 in 1965. Even these figures are unrealistic, since many families continue to provide at least partial support for children over age 18. This appears especially true if the child is in college.

An additional minimum of $2000 per year should be added to the total if parents are paying all the child's college expenses. If children marry before or soon after high school graduation, many parents will provide some support to these beginning families for a few years. This will, of course, continue to raise the total bill.

Number One Most Costly

This much is certain: 1) raising children is an expensive undertaking, and 2) second or succeeding children will cost considerably less than the first child, barring illness, serious injury or monetary inflation. It is easy to see why the second statement is true, when one realizes that furniture, equipment and some clothing will be used for succeeding children.

Today the child-rearing cost to the age of 18 is the equivalent of nearly four years of family income—and the expenses climb relentlessly ever upward.

Miss Ruley is a member of the staff of the School of Home Economics.

"Our Sue" Alexander On Magazine Cover

As pretty, modest and gracious as ever, our very own Sue Alexander appears in a beautiful color photograph on the front cover of a recent issue of "Practical Forecast for Home Economics," magazine devoted to teachers and workers in the home economics field.

In the photo, Sue is preparing foods in a studio in Minneapolis, with the cold red eye of the WCCO-TV camera staring at her.

Further on in the same magazine, under the section "Home Economics in Action," there is a two column profile (with photo) of Sue and her accomplishments.

Miss Alexander, for the few who may not know, was graduated from this college last spring. While in college she was active in a score of fields in this college — four national honoraries, honors program, editor of the student handbook, and finally the winning of the 1965 Pillsbury award. Already she has been advanced to associate manager of Pillsbury's educational program, after only a few months with that giant milling company.

Before winning the Pillsbury award, while still a student in this College of Agriculture, Sue was planning to do graduate work in preschool education, her chosen field being child development.

Now, howeevr, she is reconsidering that choice. After one year of junior executive experience with Pillsbury, Sue has the option of remaining with Pillsbury or continuing her education with a $2,500 scholarship for graduate study. A diffcult choice to make? Sue will make the right one — for that pretty head has a handsome quota of brains, judgment and stability.

Farm Accidents, Health Problems Need Attention

By
Victor A. Christopherson

Development of medical and related sciences has been such that human beings now survive and sometimes thrive under conditions that would have been fatal or almost totally disabling a short time ago.

However, there still is a wide gap between many of those who need medical and rehabilitation help and the sources of such help. This gap is sometimes caused by a lack of knowledge concerning available facilities and services and sometimes by hard-to-describe factors which reside in the person or in the rural culture of the disabled agricultural worker. For example, the injured farm worker who remains on the farm following the onset of disability is frequently resistant to occupational training that would remove him from the rural environment.

The individual who has left the farm prior to contact with the vocational rehabilitation agency seems already to have made the psychological adjustment prerequisite to vocational re-education.

Rural-Urban Gap Narrows

In many respects, the so-called "rural way of life" has changed so that the gap between rural and urban culture has narrowed substantially. Even though transportation, mass media and other aspects of modern technology have obscured clear-cut lines between the rural and the urban, in the interest of providing needed medical and rehabilitation services, one should keep in mind the possibility that real differences exist in important areas of rural and non-rural life.

It has been suggested that . . . The demands of an agricultural existence tend to give the farmer a psychological make-up quite different from that of the city resident. Typically his contacts with people tend to be fewer and he is thrown more completely on his own resources . . . He is more attached to the traditional, the 'tried and true' way of doing things. His closeness to nature and his relative helplessness against the ravages of drought or flood or windstorm make him somewhat fatalistic and, at the same time, rather stoical about the misfortunes of life. Obviously these attitudes have a bearing on the farm family's reaction to illness, injuries, or impairments, and to the need for medical services.

Physicians who practice in rural areas tend to be the senior members of their profession. Their average age has been estimated at more than 50 years. The significance of this is largely related to the recency with which rehabilitation has become a specialized field involving, in addition to medicine, such fields as physical therapy, occupational therapy, rehabilitation nursing, psychometrics, psychology, vocational counseling and home economics — principally nutrition and work simplification. In general, rural areas are underprivileged in medical services.

Expensive to the Nation

Disease and disability are known to cost the United States some $35 billion per year. The economic cost of farm accidents alone can only be

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Professor Christopherson is chairman of the Division of Child Development and Family Relations, in the School of Home Economics.

Plastic Cone Aids Desert Survival

Ray D. Jackson of the U. S. Water Conservation Laboratory at Phoenix (in white coat) gives a group of agricultural plastics experts a few tips on how to survive if they get lost in the desert.

The inverted white cones are simple pieces of plastic film small enough to fit in the palm of the hand — or carried in a pocket. The hole is about a yard wide and 20 inches deep. A container is first placed in the pit at the center of the hole. Then the plastic is spread over it, forming an inverted cone.

Sunlight penetrates the plastic film and heats the soil and surrounding plant materials. Moisture from the soil rises and condenses on the cooler plastic, then flows to the center and into the cup.

These water drops, running along the underside of the film to drop into the cup, may total up to three pints of water a day — important to survival of a human.

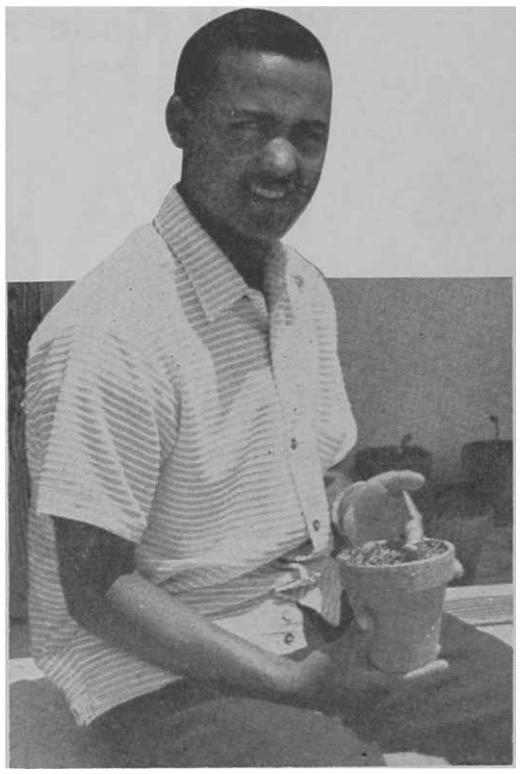
Ethiopian Student Gives Thanks to U.S.

Bantayehu Gelaw, pictured here in the agronomy greenhouse on this campus, completed his graduate studies in this College of Agriculture last June. Title of his thesis was "Factors Affecting Germination of Safflower Seed." Bantayehu is now a lecturer at the Haile Selassie First University, in his native Ethiopia.

Writing to his major professor, Dr. Robert Dennis, Bantayehu speaks feelingly of his appreciation for the opportunity to study in this country and on this campus:

"Each year about 5,000 foreign students are enrolled in colleges of the United States under the sponsorship of the AID Program. I am one of the 5,000. My two years in the United States have enabled me to know and respect Americans, for they have extended their hands in friendship.

"To the people of America I want to say thank you. Surely this support of students from foreign lands will help in an understanding which will benefit all of the countries of the world and their citizens. The ideal of



BANTAYEHU GELAW

this and other similar programs will be reached when the exchange functions both ways. Perhaps someday soon more American youth will be privileged to live and study in other continents beyond the shores of their country. I will work toward making this possible in my country, Ethiopia.

"One of the many projects of the AID program is the implementation of a long term plan for agricultural extension, research and education. A major part of this plan consists of training appropriately individuals of many different nationalities.

"As an Ethiopian, I hate cruelty and arrogance wherever it exists. It is my firm belief that neither law nor police force will change the inherent thinking of individuals or nations. Much has been done to wipe out racial discrimination from the face of the earth, but unless peace is built in the hearts of men, true love, respect and mutual co-existence will not endure.

"It is my earnest desire, now that I am back in Ethiopia, to use the training I have received in the United States to help raise yields and the standard of living of the people of my country. Ethiopia holds a unique position in her support of freedom and is a strong supporter of the basic principle that only through collective security and international morality can lasting peace be attained. My studies at the University of Arizona will help me to be of greater service to the people of my country."

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estimated. It seems highly probable, however, that hospitalization and medical treatment are but minor in relation to the cost of loss of wages and production.

The agricultural industry appears to be among the most hazardous. The actual number of deaths resulting from farm work has been larger in recent years than that of any other major industry. However, the death rate per 100,000 workers places the agricultural industry behind mining and construction work, respectively.

Even though farm accident fatalities run high, the non-fatal injuries appear to occur about 500 times as frequently. Figures from the National Safety Council suggest that approximately 1,000,000 such injuries occur every year. Tractors alone account for approximately 45,000 non-fatal accidents per year.

The agricultural worker is very prominent in injury and mortality tables, yet his vocational disposition, once a disabling injury has occurred, is something of a mystery. For example, in Arizona many of those who receive vocational rehabilitation are referred from the State Industrial Commission.

However, those eligible for Industrial Commission benefits are limited to persons whose injuries were incurred through operation of farm machinery only. Very few, if any, records are kept on the large numbers who apparently do not come to the attention of the Industrial Commission or the Vocational Rehabilitation Agency.

We Can Do Better

Preventing disabling accidents and diseases and, once they have occurred, helping the individual acquit himself with dignity and profit, both occupationally and socially, are goals worthy of the best talents and efforts of a concerned society. That agricultural injuries result in a tremendous economic and human loss cannot be gainsaid. It is time that both medical and social sciences accord the rehabilitation of the disabled agricultural worker the high priority the problem deserves.

FARM SIZE AND BEET COSTS

Bigness, alone, does not insure a production cost advantage for sugar beet growers. Increased output accounts for only 25 percent of the decreased cost per ton, say North Dakota agricultural economists. Other important factors affecting total cost per ton are managerial ability, soil fertility, and weather. L. D. Loftsgard and Robert Yaggie conducted a study involving 132 growers. They found that with average costs and an average yield of 13 tons an acre, the grower with 500 acres has production costs about $1.50 less per ton than the grower with 35 acres.

FOOD SPENDING

Consumers spent $85.5 billion for food last year, according to USDA, Food expenditures averaged $439 per person.

NO ES PRACTICO seleccionar ovinos en base a simples preferencias y gustos. Hay caracteres hereditarios que no se pueden tolerar aun cuando los animales que los presentan pretenden algún mérito. Debe descartarse todo animal que presente uno de estos defectos: Prognatismo superior o inferior. Patas deformes. Conformación pobre o defectuosa. Vellón con características indeseables como la presencia de fibras pigmentadas y de pelos. Cara cubierta de lana o ceguera por lana.

Effect of Certain Salts On Germination of Alfalfa And Berseem Clover Seed

By I. H. Khatib and M. A. Massengale

Saline soils are found mainly in the arid and semi-arid regions of the world, where the amount of rainfall is insufficient to cause leaching of the salts. If such lands are irrigated, the water used for this purpose often contains a high percentage of salts which accumulate in the soil, particularly if the soil is not well drained. In 1956, estimates indicated that about 25 per cent of all the irrigated soils in the United States was classified as saline. In the western United States, salinity is a serious threat to crop production.

Different kinds of salts occur in saline soils, and the effect of these salts on plants may vary, depending on the stage of development. Germination of seeds is a critical stage of development in which the plant resumes growth. It is also during germination and early seedling establishment that most plants show their greatest injury from salt.

Salts may affect germination of seeds by decreasing the rate and total amount of water absorbed, and by increasing the entry of certain ions in sufficient amounts to be toxic. Once established, certain forage legumes can grow and produce satisfactory yields in soil having a high salt content.

The authors are, respectively, a former graduate student and Professor in the Department of Agronomy.

Two Major Forage Crops

Alfalfa, a legume having wide adaptation, is a major forage crop in the United States. Berseem clover is the principal forage crop in the Nile Valley in Egypt. Recently, there has been some interest in berseem clover in Arizona. The range of adaptation and usefulness of these forage plants would be greatly extended if varieties were available that were less susceptible to injury from salts, particularly during germination and seedling establishment.

This study was made to determine: (1) if there were differences among Sonora, Lahontan, and Ranger alfalfas and Miscawi berseem clover in their tolerance to salinity during germination; (2) the effect of three salts alone and in all possible combinations on the rate and total percentage of seed germination of these varieties.

The three salts studied were sodium chloride, calcium chloride and magnesium chloride. All salts were dissolved individually in distilled water and mixed at the ratio 1:1 or 1:1:1 on a weight basis to make seven different salt and salt combinations. Seeds of each variety of alfalfa and berseem clover were germinated in 10 concentrations of each salt and salt mixture, ranging from zero to 18,000 parts per million, with increments of 2,000 ppm.

Check on Germination

The experiment was conducted in the laboratory by placing 100 seeds of each variety on two filter papers

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STATE'S '65 AGRICULTURAL INCOME $582.3 MILLIONS

Spurred by big gains in cattle, vegetable crops and sheep, the gross value of Arizona's agricultural product was $52.2 million bigger in 1965 than it was in 1964. The 1965 total of all agricultural and forestry production was $582.3 million, compared to $530.1 million in 1964. There were declines in revenues from cotton and citrus fruits, both major factors in the Arizona economy.

These are among the significant facts gleaned from "Arizona Agriculture 1966," just published by The University of Arizona College of Agriculture. The bulletin is available free of charge at the county agent's office in your county.

The publication notes that decreases in the values of cotton and citrus produced during the year were more than offset by increased values of cattle and calves, vegetables, feed grains, sheep, lambs and wool. Estimated gross value of the state's agricultural product during 1965 was 11 per cent higher than in 1964, and was exceeded only in 1962.

Value of all cattle and calves in 1965 came to $190.1 million, compared to $153.7 million in 1964. This is an increase of 24 per cent, a result of both increased marketings and higher prices per pound for all classes of cattle. This was the third year in a row that income from cotton lint and cottonseed dropped. The estimated income in 1965 was $133.1 million. It was $134.6 million the previous year.

The gross value of Arizona's vegetable crop increased $11.06 million, due to an exceptionally favorable early spring lettuce deal. In addition, the potato, carrot, and onion crops brought substantially greater income. These easily offset declines in value for cantaloup, honeydew and watermelons.

Other commodities which brought higher gross incomes during the year were dairy products (up 4 per cent), feed grains (up 16 per cent), and hay (up 5 per cent). Increased income for feed grains resulted from higher production of both barley and grain sorghum, with barley prices increasing while sorghum prices declined.

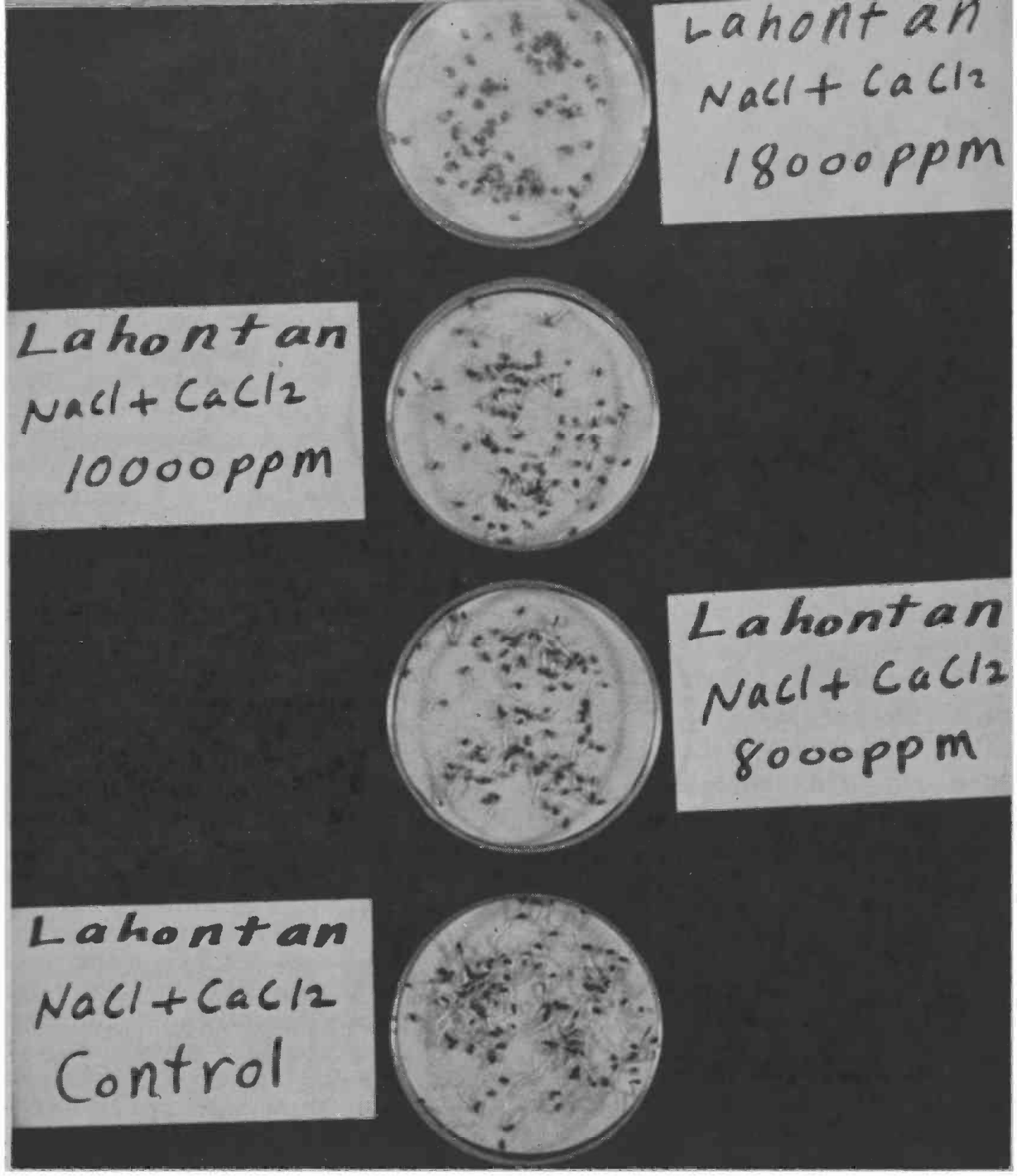

FIGURE 1 — Seeds of Lahontan alfalfa seven days after being placed on filter papers saturated with 5 cc. of salt solution containing sodium chloride and calcium chloride at varying concentrations.

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in petri dishes (Fig. 1). The filter papers were saturated with 5 cc of the specific salt solution before seeds were placed on them. The petri dishes containing the seeds were kept in a germinator held at 20° + 1° C and illuminated for eight hours daily. The germinating seeds were counted at 3-, 5-, and 7-day intervals to determine the rate and total percentage of germination.

Note Varietal Differences

More seeds of Sonora alfalfa germinated in the salt solutions than did seeds of any other variety of alfalfa or berseem clover, when averaged over all salts and salt concentrations. Seeds of Lahontan alfalfa and Miscawi berseem clover were intermediate in percentage germination, while Ranger alfalfa was the lowest (Fig. 2).

Although salt was not a factor in the development of Sonora alfalfa, seed of this variety might be expected to tolerate salinity better during germination than seeds of other varieties tested. Sonora was developed in Arizona and is adapted to the arid southwestern part of the United States and to northern Mexico, where many of the soils are classified as saline.

Effect of Salts

Magnesium chloride was the most toxic of all salts on seed germination. Sodium chloride was more toxic for germinating seeds than calcium chloride. In general, the combined salts were less toxic on seed germination than the single salts (Fig. 3). This may be due to the lower concentration of a specific salt when it is in mixture with other salts than when alone.

Another explanation for this result could be the antagonistic phenomenon exhibited when cations mixed together cancel the effect that each alone has on permeability of the cytoplasmic membranes.

Increasing the salt concentration decreased the germination percentage of all varieties (Fig. 2). Germination of seeds of Lahontan alfalfa appeared to be stimulated at the low salt concentration of 2,000 ppm. At high salt concentrations (above 12,000 ppm) few seeds germinated (Figs. 2 and 4).

The rate of seed germination decreased with increasing salt concentrations (Fig. 4). Most of the seeds of all varieties germinated between

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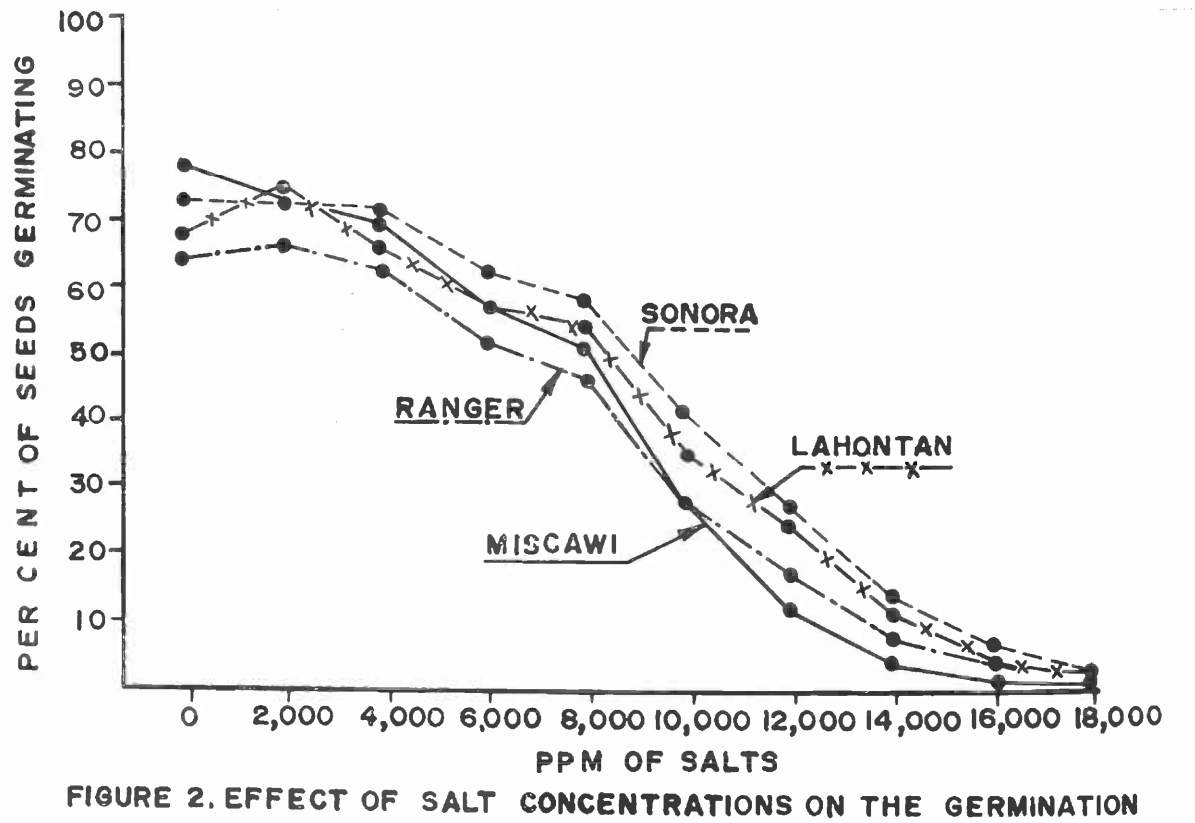

FIGURE 2. EFFECT OF SALT CONCENTRATIONS ON THE GERMINATION PERCENTAGE OF SEEDS OF SONORA, LAHONTAN AND RANGER ALFALFAS AND MISCAWI BERSEEM CLOVER.

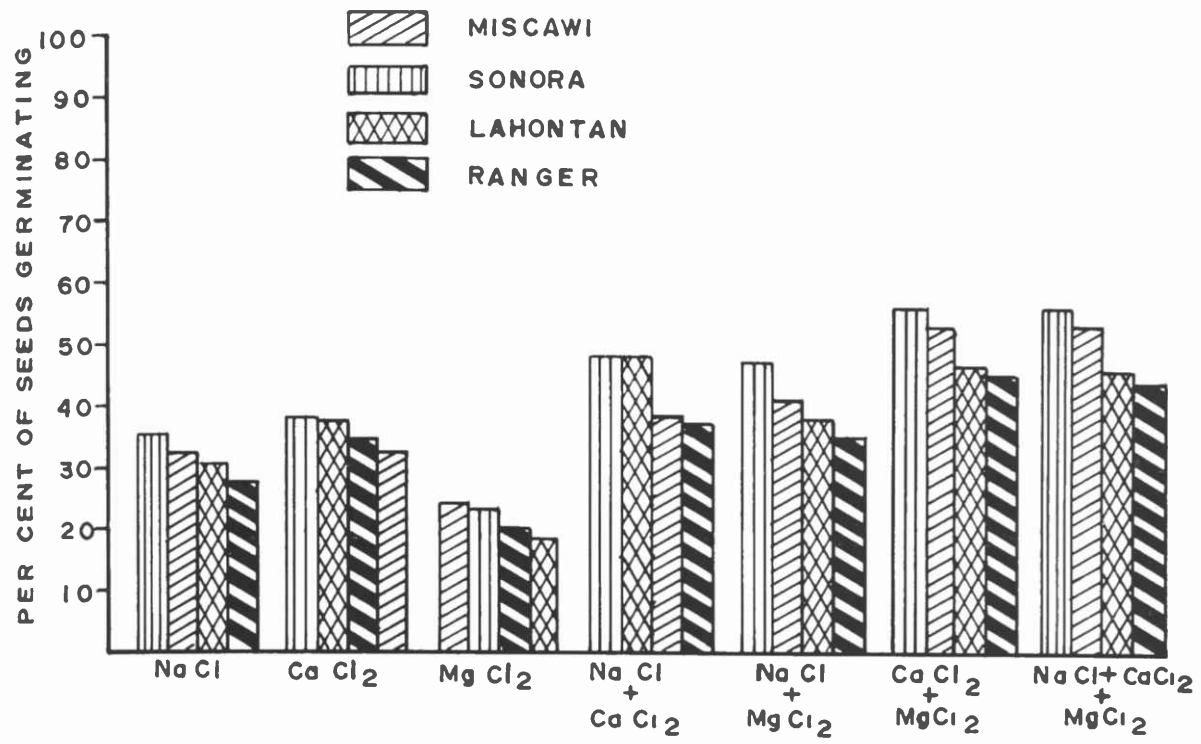

FIGURE 3. GERMINATION PERCENTAGE OF SEEDS OF SONORA, LAHONTAN AND RANGER ALFALFAS AND MISCAWI BERSEEM CLOVER UNDER SEVEN DIFFERENT TYPES OF SALT AND SALT COMBINATION.

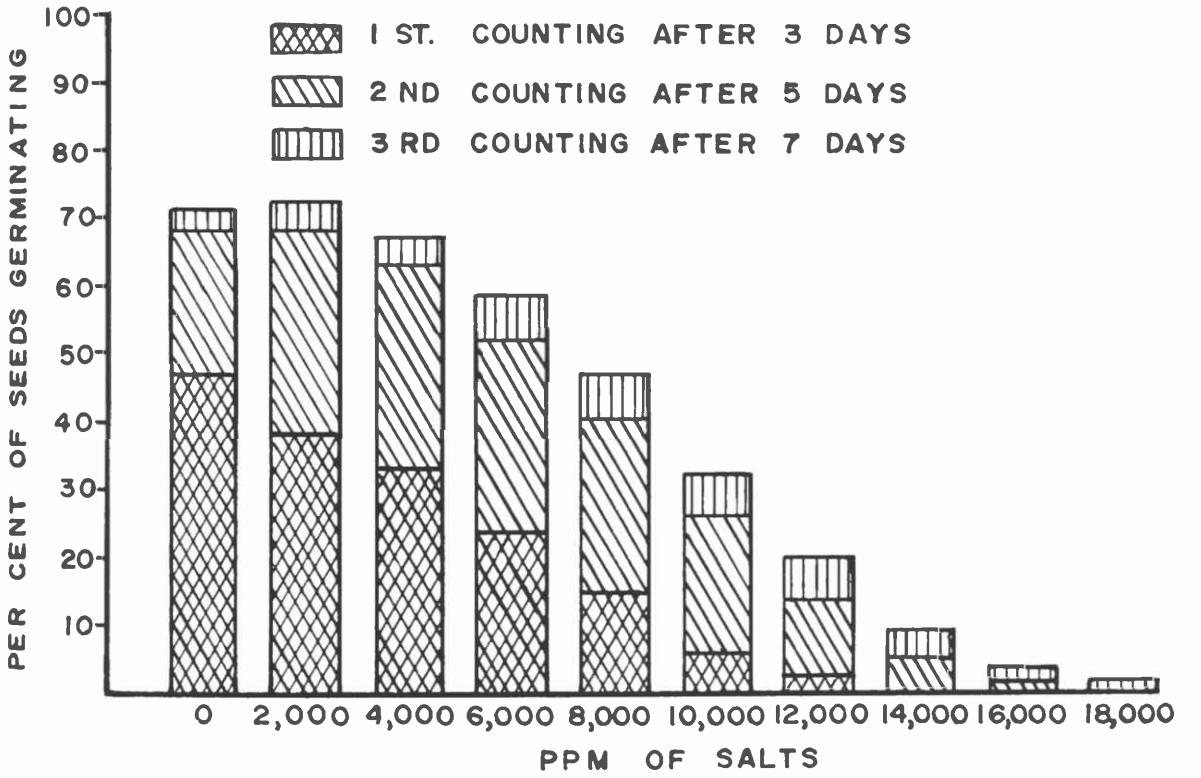

FIGURE 4. EFFECT OF SALT CONCENTRATION ON THE RATE OF SEED GERMINATION OF SONORA, LAHONTAN AND RANGER ALFALFAS AND MISCAWI BERSEEM CLOVER.

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the third and fifth day, while a few additional seeds germinated after the fifth day. However, at high salt concentrations those seeds that germinated usually did so between the fifth and seventh day.

Sonora Most Tolerant

From this study one could conclude that: (1) there were differences among the varieties and species tested in their tolerance to salinity during germination. The entries can be arranged in the following decreasing order of tolerance: Sonora and Lahontan alfalfas, Miscawi berseem clover and Ranger alfalfa; (2) magnesium chloride reduced germination percentage more than sodium chloride and calcium chloride, and the combined salts were less toxic to germinating seeds than single salts, (3) the rate of germination and total percentage of germinating seeds both decreased with increasing salt concentration.

Early Pima Agent Aided Start Of Tucson Mt. Park

EDITOR'S NOTE: An early generation of County Agricultural (Extension) Agents deserve much praise for development of agriculture in Arizona and other states. Now those veterans are leaving their desks and pickups, turning them over to a younger generation. Our last issue told of retirement of one of the best — G. E. Blackledge.

Now we tell about another, C. B. Brown, an early day county agent in Pima County, who (now aged 77) tells of his part in establishing Tucson Mountain Park. Here it is, in Mr. Brown's own words:

"I served as County Agricultural Agent, University of Arizona from 1919 to July 1, 1944, when I resigned principally on account of ill health, and retired to a small ranch in southern Pima County near Greaterville. Director C. U. Pickrell asked me to stay on, but on account of the affliction which I incurred in the early 1940's that made it difficult for me to carry on my work, I thought it best to retire.

"In August of 1948 we sold our small ranch and for nine months I was superintendent of Tucson Mountain Park, comprising 30,000 acres of desert mountains and mesas a short distance west of Tucson. I originated the idea of establishing this park; and while I was president of the Tucson Game Protection Association in the late 1920's this idea took form.

"With the help of public-spirited members of the association, also my good friend Jack Kinney, chairman of the Pima County Board of Supervisors, and Senator Carl Hayden in Washington, we were successful in getting 60,000 acres of federal land temporarily withdrawn from homestead entry, which was quite active at that time.

"We selected out approximately 30,000 acres that would be suitable for park purposes and a permanent home for desert wild life. In April of 1929 the first lease by the county was secured on some 16,000 acres at 1½c per acre. There were many mining claims on the area, and the status of the remaining acreage and classification had to be determined by the Department of the Interior. Several years ago the north half of Tucson Moun-

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Prior to World War II, a major portion of the cattle marketed for beef in the United States was slaughtered off native grass or pasture without being fed for any length of time. This changed rapidly after 1945, and by 1963 approximately 57 percent of the cattle slaughtered were marketed out of feedlots.

STOCKER-FEEDER CATTLE PRICES

By
Thomas M. Stubblefield

Development of the large single enterprise commercial feedlots in Arizona, California, Colorado and Texas accompanied the increase in the slaughter of fed cattle. Feeders in these states found it profitable to feed the crossbreed type cattle called "Okies" which are produced in Texas, Oklahoma, Arkansas and Louisiana.

This brought about a pattern of stocker-feeder[1] movements that appeared illogical. Stocker-feeder cattle moved from the southern states to the feedlots in the western states, while stocker-feeder cattle produced in the western states moved to the Corn Belt for feeding.

The author is an Agricultural Economist, Department of Agricultural Economics. A more complete treatment of this subject, by Dr. Stubblefield, is contained in Technical Bulletin 172, now in press. Interested readers will be able to obtain this bulletin from their local county agent's office.

[1] The term "stocker-feeder cattle" is used in this article to refer to cattle and calves which may be used for breeding, further growth, or feeding.

Analysis of Markets

The Department of Agricultural Economics at The University of Arizona analyzed the prices received at Los Angeles and Stockton, Calif.; Phoenix, Ariz.; Billings, Mont.; Ogden, Utah; Denver, Col.; Omaha, Nebr.; Kansas City, Mo.; and Amarillo, Ft. Worth, and San Antonio, Texas, for eight categories of stocker-feeder cattle to determine if the pricing pattern explained the movement of stocker-feeder cattle.[2]

The method of analysis used indicated which of the average prices received at the respective markets was significantly different (statistically). Some of the average prices were not significantly different, and in such cases they are considered equal.

The study covered the period 1957 to 1961. Results of this analysis show that those markets nearest to the Corn Belt paid the highest prices, on the average, for Choice and Good grade feeder steers and steer calves. The supply of these grades and weights of stocker-feeder cattle in the 11 western states was greater than needed to meet demands of the feeders in these states.

[2] The nine categories of stocker-feeder cattle prices analyzed were Choice 500-800 pound stocker-feeder steers, Good 500-800 pound stocker-feeder steers, Medium 500-1,000 pound stocker-feeder steers, Choice 500-750 pound stocker-feeder heifers, Good 500-750 pound stocker-feeder heifers, Good and Choice 250-500 pound stocker-feeder steer calves, Medium 250-500 pound stocker-feeder steer calves, Good and Choice 250-500 pound stocker-feeder heifer calves, and Medium 250-500 pound stocker-feeder heifer calves.

Prefer Small Carcass

Choice 500-700 pound stocker-feeder heifers sold for the highest average price at Omaha. The second highest

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tain Park was made a part of the Sahuaro National Monument. The south half has been retained by Pima County, and is the home of the Arizona-Sonora Desert Museum and Old Tucson.

"Much of the county's part has been purchased from the U. S. Department of the Interior, one section each year. In 1929 there was little wild life present, but with the establishment of the area as a state game refuge, and 10 years of protection, mule deer and javelina became plentiful, and a small band of mountain sheep inhabited some of the higher peaks.

"One day while the county park committee was holding a meeting on the north end of the long low mountain near the present site of the Desert Museum, Dr. E. P.. Mathewson took the chair and made a motion that this mountain be called Brown Mountain. I said you had better wait until I am gone; however, there was a second by Al Condron, secretary of the Tucson Chamber of Commerce, carried and recorded by the secretary, Dr. T. D. Mallery.

"At the time of establishment of Tucson Mountain Park, the human population of the area did not exceed 30,000, but at the present the metropolitan area has close to 350,000. It therefore occupies a very important place in the chain of recreational areas serving this center of population. The land at present prices would be worth many millions of dollars.

"Thanks is due The University of Arizona for my having the opportunity to serve Pima County for many years in the establishment and supervision of Tucson Mountain Park during the earlier years of its existence. I am still a member of the county advisory park committee."

Japanese Quail Used as Research Fowl

By R. D. Hendershott and B. L. Reid

The Poultry Science Department of The University of Arizona has established a colony of *Coturnix Coturnix Japonica,* or Japanese quail, now housed at the University's Poultry Research Center. The original hatching eggs were obtained from the University of California at Davis through the courtesy of Dr. W. O. Wilson, head of the Poultry Science Department there.

As early as the 12th century, the Coturnix quail were domesticated in Japan and developed as song birds. By 1910, Coturnix quail were being used for meat and egg production in Japan. During World War II, the varieties of song quail disappeared entirely and the domesticated quail virtually disappeared because their feed sources were incorporated into the war effort.

Eggs Are a Delicacy

Japanese Coturnix production is presently flourishing and considerable amounts of the Coturnix eggs and meat are consumed in Japan. It is even possible to purchase small cartons of quail eggs in that country, and they are considered a highly prized gift from one person to another, since eggs are regarded as a delicacy.

Attempts to establish these quail as a game bird in the United States during 1955 to 1957 failed. The failure to develop this prolific species for game purposes has been attributed to their migratory nature and the fact that the pen-reared birds are unable to survive in the wild.

The value of Coturnix quail as an experimental animal has increased in recent years. Much work has been conducted in avian physiology with Coturnix, and the University of California has conducted research in genetics, effect of lighting, and hormonal interrelationships with quail. Auburn University has been the forerunner in the use of Coturnix in avian research in the United States, first using the Coturnix in 1953. Most of the work to date has been applied to poultry management. Little on the nutritional requirements of the Coturnix has been attempted.

Desirable for Research

The advantages of using Coturnix quail in research are primarily related to cost and time. They are inexpensive to maintain, require a relatively small area and the high metabolic rate makes them excellent test animals for drugs and metabolites. Their short life cycle is a great advantage to the geneticist. Space requirements are about one-tenth that of chickens.

Coturnix quail, compared with many laboratory species, are unselected and exhibit a high degree of individual variation. Special care must be taken in rearing quail chicks, due to their inability to maintain their body temperature during the first critical 4 to 5 days. Generally, a 24 to 28 percent protein diet, highly forti-

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The authors are members of the Department of Poultry Science, Dr. Reid being head of that department.

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markets were widely scattered geographically—Ft. Worth, Kansas City, Denver and Ogden. The higher price at Ogden, Denver and Ft. Worth is due to local preference for small carcasses and local feeding of heifers to meet this preference. Kansas City's location near the Corn Belt accounts for its price position.

Prices received for Good 500-700 pound stocker-feeder heifers also indicate the preference in certain areas for lighter-weight carcasses, i.e., Denver, Amarillo, Ft. Worth and San Antonio. In the case of San Antonio, part of the cattle that qualify for this category of stocker-feeder cattle also qualify as slaughter calves. This resulted in San Antonio having the highest average price.

The prices paid for Good and Choice 250-500 pound stocker-feeder heifer calves reflects the preference for a smaller carcass in the Ogden, Omaha and Kansas City areas and demand for replacement heifers in these, as well as the Billings and Amarillo, marketing areas.

Phoenix Inconsistent

Los Angeles, Omaha, Kansas City and San Antonio had the highest average prices for Medium 500-1,000 pound stocker-feeder steers. Phoenix, Ogden and Billings had the lowest average price. However, Phoenix's position is inconsistent with the fact that large numbers of this category of stocker-feeder cattle are brought into the state for feeding. Apparently, there was not enough of this kind of cattle offered for sale to make it economical for the feeders to sort them into uniform lots (approximately same weight and age) of 50 head or more.

Billings had the highest average price for Medium steer and heifer calves. This can be explained by the demand for thin-fleshed stocker calves to stock ranges and wheat pastures in winter wheat areas. Otherwise, the higher priced markets were in California and Arizona.

Results of these analyses are consistent with the movement patterns of stocker-feeder cattle. The Corn Belt is the major market for Good and Choice grade stocker-feeder steers and calves. The higher prices for stocker-feeder heifers were paid in areas where there was a demand for stocker heifers and where smaller carcasses are desired. The major area for feeding Medium grade stocker-feeder cattle is the southwestern United States.

San Antonio Unique

The San Antonio area was unique in that it was the highest priced market for Good grade stocker-feeder heifers. Also, it was one of the highest priced markets for Medium grade stocker-feeder steers. These prices reflect the relative demand for lower quality beef and slaughter calves in that market, and use of these categories of stocker-feeder cattle for feeding in the south Texas area.

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fied in vitamins, minerals and antibiotics, is fed throughout their life cycle. Coturnix have been reported to be susceptible to some common poultry diseases such as fowl pox, Newcastle disease and infectious bronchitis viruses. They are also susceptible to the following bacterial pathogens: *Salamonella pullorum, S. gallinarium, S. typhimurium, Pasteurella multocida* and one pathogenic strain of *Escherichia coli.* They are also subject to fungus infections by *Aspergillus funigutus.* Although the list of diseases may appear ominous, the Coturnix, under proper management conditions, remains healthy.

After the first three weeks of age, the sexes can be determined by inspection of the breast and throat feathers. Both male and female have light, charcoal wing and back feathers. The upper throat and lower breast feathers of the male are cinnamon color and slightly rounded, while the female breast and throat feathers are of a lighter shade and are pointed. The male's voice has been described as a loud, castanet-like crow that sounds similar to "pick-per-awick" or "ko-turro-neex."

Make Rapid Growth

Day-old Coturnix weigh approximately 8 to 12 grams. The adult male and female weigh 120 and 150 grams respectively. Maximum body weight is reached about the same time birds reach sexual maturity (35 to 50 days), and feed requirements from hatching to maturity are only one pound per bird compared with 25 to 28 pounds for chickens.

The eggs received from the University of California were placed in the incubator and hatched 16 days later. The time between hatching and the onset of egg production was 40 days. The birds were producing at a rate of 90 percent by 52 days of age.

Egg weight averages approximately 10 grams or about 8 percent of total body weight of the females, in comparison with 3 percent in chickens and one percent in turkeys. A variety of color patterns is characteristic of Coturnix eggs. Colors range from dark brown, blue, white and buff, heavily mottled with black, brown and blue. The dark pigment is prophyrin. A blue coloration found on many eggs develops from calcium deposits over the pigmented layer.

The University of California at Davis has observed that individual Coturnix produce eggs of similar shape, size and color pattern. The characters for egg color patterns are highly heritable and may be selected.

Total eggs produced varies from bird to bird, but averages around 250 per year. It is possible to maintain the females as egg producers for as long as 18 months. Under this situation, it is not unusual to obtain as many as 400 eggs per female.

In Nutritional Studies

The Poultry Science Department of the University of Arizona has initiated studies using Coturnix quail in order to evaluate their effectiveness as experimental animals for nutritional and physiological studies. If the information obtained through the use of these birds can be applied to chickens, the time and expense of such studies will be reduced considerably. In addition, the use of quail will also make possible experiments of a more sophisticated nature involving the feeding of chemically pure amino acids rather than intact protein. Such studies should greatly facilitate a more precise determination of the amino acid needs of poultry for egg production by eliminating the factors of ingredient quality and amino acid availability, which tend to complicate studies employing ordinary feedstuffs.

Battle of the Bulge.

CROWDED CANTALOUPS SHOW SHIPPING LOSS

By Norman F. Oebker and Robert F. Kasmire

Is it necessary for western shippers to bulge pack crates of cantaloups? We don't think so. In fact, we feel that the whole produce industry would be much better off if this method of packing were eliminated.

The practice of cramming oversize melons in a crate is standard procedure with most cantaloup packing and shipping operations. When one asks why, the usual answer is, "The buyer wants them that way," or you are told that melons not packed tightly will have more scuffing or will become "shakers". (A "shaker" is a melon with loose seeds). The purpose of this report is to present evidence which questions the validity of bulge packing.

Results in Loss

The damage caused by bulge packing is not taken seriously enough. Many retail produce men estimate that two to four melons are lost from each crate because of compression due to overpacking. Experimental laboratory studies in California have supported this claim.

To show what losses do occur from this practice in actual handling and transportation, a cooperative study was made last summer by The University of Arizona and the University of California, with support and encouragement of the Western Growers Association.

During the first part of July, 1965, two test shipments of cantaloups were made from Yuma to midwestern markets. Both commercial (bulge) packed and level packed crates were included in each shipment. The 13 inch W.G.A. crate was used. Level packed crates averaged nine pounds less gross weight than the commercial (bulge) packed crates. One railroad car with both packs went to St. Louis; another to Cincinnati.

After seeing the cantaloups packed, loaded and on their way, we went to St. Louis to examine the first shipment as it was unloaded at the grocery warehouse. Two days later we studied the other shipment in Cincinnati.

With each type of package we observed the cantaloups individually for overall market quality (condition), bruising, scuffing, firmness and seed

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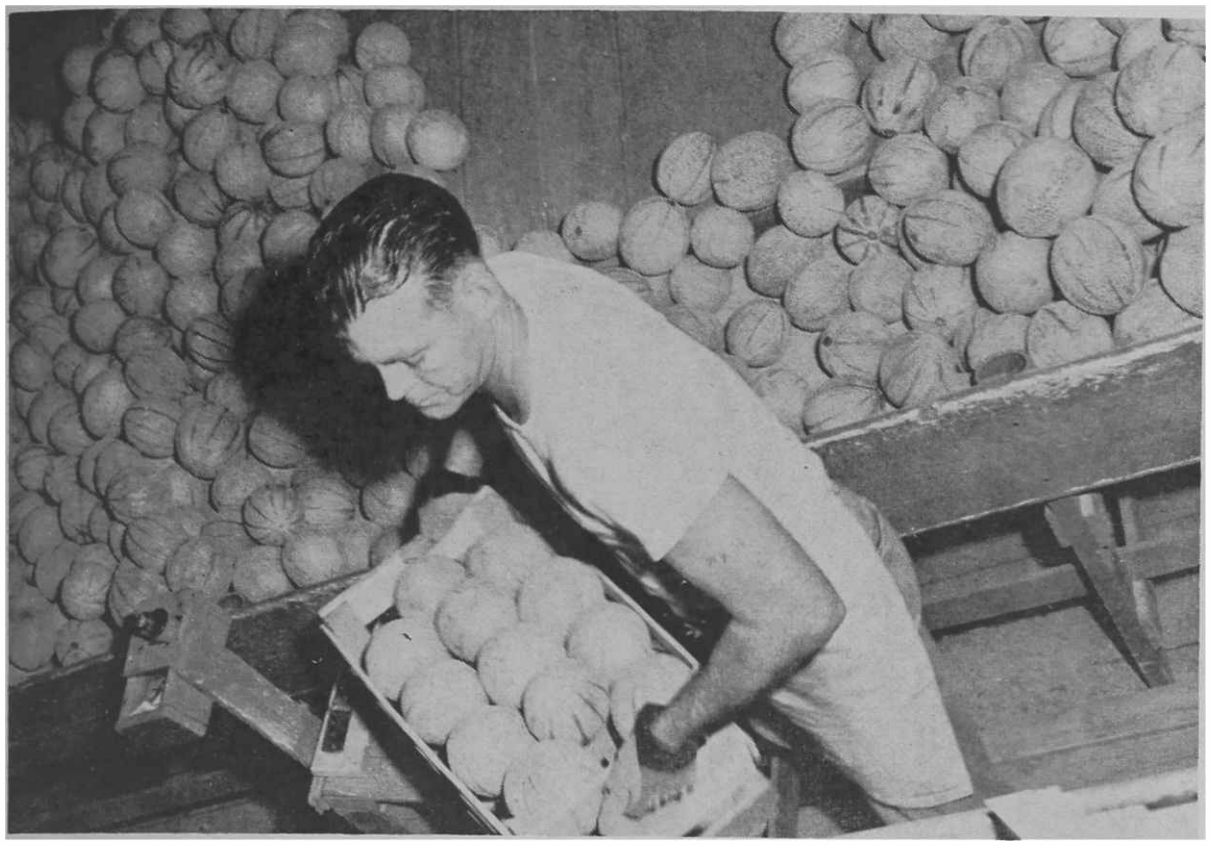

"BULGE PACKING" of cantaloups, so that bowed crates press too tightly against each other in transit, results in damaged fruit and loss to the seller.

Observations on scuffing did not support the claim that level or slack packed cantaloups have more vibration damage. Actually, the bulge crates had more scuffed cantaloups. See Table 2.

Many handlers think that transit vibration of loosely packed cantaloups will result in more melons with loose seeds in their cavities (shakers). These test shipments showed no increase of shakers by level packing. Observations on shakers are summarized in Table 3.

Cuts Marketing Losses

After making this study, it appeared to us that level packing offers a means of reducing marketing losses, thereby delivering to the retailer a higher percentage of good marketable cantaloups per crate.

Work will continue this season on development of new containers and methods for handling and packing cantaloups.

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cavity condition. All crates were packed as 27's. Some crates were of the Hard Ripe maturity; others were considered Eastern Choice.

Our findings on this trip are revealing as to the actual damage caused by bulge packing.

Four Fruit Injured

We found that on the average, almost four cantaloups in the commercial (bulge) packed crate were so damaged by bruising, splitting, cutting and scuffing (all defects that can be caused by over-packing) that they would have to be reduced in price to sell or would have to be discarded. In the case of level packed crates, an average of only half a cantaloup per crate was similarly affected.

At Cincinnati, with the Choice melons, the difference was even greater. In the bulge pack, almost eight cantaloups were affected severely enough to be marked down or discarded, while in the level pack less than one cantaloup per crate was similarly affected. The average number of melons per crate that were damaged by over-packing, is shown in Table 1.

Dr. Oebker is Extension Horticulturist at The University of Arizona, while Dr. Kasmire is Extension Marketing Technologist at the University of California at Davis.

Table 1. Number of Melons Per Crate Which Were Moderately-Severely Bruised, Split, Cracked, or Cut.

	LEVEL PACK		
	DESTINATION		
Maturity	St. Louis	Cincinnati	Ave.
Hard Ripe	.7	.0	.4
Choice	.4	.9	.4
	Over-all Ave.		.5

	COMMERCIAL (BULGE) PACK		
	DESTINATION		
Maturity	St. Louis	Cincinnati	Ave.
Hard Ripe	.7	5.6	3.2
Choice	1.3	7.6	4.5
	Over-all Ave.		3.8

Table 2. Number of Melons Per Crate Which Were Moderately-Severely Scuffed.

	LEVEL PACK		
	DESTINATION		
Maturity	St. Louis	Cincinnati	Ave.
Hard Ripe	.2	.0	
Choice	.0	.1	
	Over-all Ave.		.08

	COMMERCIAL (BULGE) PACK		
	DESTINATION		
Maturity	St. Louis	Cincinnati	Ave.
Hard Ripe	.0	1.1	.6
Choice	.3	.3	.3
	Ovel-all Ave.		.4

Table 3. Number of Melons With Loose Seed Cavities (Shakers) Per Crate.

	LEVEL PACK		
	DESTINATION		
Maturity	St. Louis	Cincinnati	Ave.
Hard Ripe	12.2	12.5	12.4
Choice	10.5	10.4	10.5
	Over-all Ave.		11.4

	COMMERCIAL (BULGE) PACK		
	DESTINATION		
Maturity	St. Louis	Cincinnati	Ave.
Hard Ripe	9.7	14.1	11.9
Choice	12.4	13.6	13.0
	Over-all Ave.		12.5

Arizona County Agent Officers

The handsome quintet above are the officers of the Arizona County Agents Association. Left to right, Amos Underwood, president; Otis Lough, vice president; Paul Lineberry, secretary-treasurer; Robert "Pat" Gray, director for the northern district, and Robert E. Grounds, director for the southern district.

Underwood is county agent at Holbrook, Lough at Phoenix, Lineberry and Grounds work out of the Yuma office, while Gray is at Globe.

The candy stick canes are symbols of service, each stripe representing a year of service in agricultural extension work.

PROGRESSIVE AGRICULTURE IN ARIZONA

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Harold E. Myers Dean

to: