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EVALUATION OF THE POTENTIAL FOR IMPROVEMENT
OF THE
MUNGBEAN AS A MAJOR FOOD GRAIN LEGUME

First Progress Report
Contract No. AID/CM/ta-C-73-36
31 December 1973

Office of Agriculture
Bureau for Technical Assistance
Agency for International Development
Washington, D. C. 20523

First Progress Report
Contract No. AID/CM/ta-C-73-36
December 31, 1973

A. REPORT SUMMARY

1. Project title: Evaluation of the Potential for Improvement of the Mungbean as a Major Food Grain Legume.
2. Principal investigator: J.M. Poehlman, 208 Waters Hall, Columbia, MO.
Contractor and mailing address: University of Missouri, Contracts and Grants Officer, 817 Clark Hall, Columbia, Missouri 65201.
3. Contract period: May 14, 1973 through May 13, 1975
4. Period covered by report: May 14, 1973 through December 31, 1973.
5. Total AID funding of contract to date: \$25,000.
6. Total expenditures and obligations through previous contract year: n.a.
7. Total expenditures and obligations for current reporting period
(May 14, 1973 through December 31, 1973): \$5453.91.
8. Estimated expenditures:
January 1, 1974 through May 13, 1974: \$7000.00.
May 14, 1974 through May 13, 1975: \$12,546.09.

B. NARRATIVE SUMMARY OF ACCOMPLISHMENTS AND UTILIZATION

Four hundred and seventy-five strains of mungbeans were grown at Columbia during the summer of 1973 and evaluated for yield, maturity, plant characteristics, yield components, and disease resistance. These included 98 strains previously evaluated and 377 new strains. Several hundred additional new strains have been received and will be evaluated in 1974 insofar as resources permit. Results will be published and seed of strains identified as having outstanding characteristics will be made available to mungbean research workers in other areas including LDC countries.

The Second International Mungbean Nursery was distributed to twenty-five cooperators in fourteen countries. Data from these nurseries will be collated and published.

Studies in controlled plant environmental chambers have confirmed observations made in the First International Mungbean Nursery that mungbean varieties do not show a differential response in photoperiods of 12-hours or less, but a differential response is exhibited as the photoperiod is increased. Critical photoperiods which delay flowering are in the 13- to 16-hour range, and differ with different varieties.

Report for Period May 14, 1973 through December 31, 1973

A. General Background

The purpose of this contract is to explore the potential of the mungbean (*Vigna radiata* (L.) Wilczek) as a high protein grain legume crop with a broad climatic adaptation. Mungbeans are widely grown across Asia, and parts of Africa, Central and South America, Australia, and the U.S.A. Its short duration and easy cultivation makes it adapted to multiple cropping systems. In parts of Asia the mungbean is favored as a pulse for supplementing cereal proteins in family diets because it is easily prepared and is low in flatulence. In many areas, the mungbean is grown mainly as a catch crop after rice to provide food for home consumption or for local markets. Yields are low due to use of unproductive native varieties and poor cultural practices. Authentic information on the genetics, diseases, and culture is scanty and diversity of germplasm has been relatively unexplored.

B. Project Objectives

1. To examine the genetic potential within the mungbean species and identify characteristics of the mungbean plant important for its genetic improvement.

2. To conduct a mungbean screening nursery in cooperation with interested mungbean research workers in other countries and international research institutes to learn the potential climatic adaptation of selected strains.

3. To conduct research on breeding problems that will contribute to improvement of the mungbean crop.

C. Continued Relevance of Objectives

The importance of the objectives have not changed.

D. Accomplishments to Date

Objective 1 (To evaluate the genetic potential of the mungbean species)

During the period June through October, 1973, we grew 475 strains of mungbeans at Columbia, Missouri. Of these, 98 were strains which had been evaluated in 1972 and were reentered in the nursery due to superior performance in previous years and 377 were new strains which we were growing and evaluating for the first time. The new strains were received from India; Iran; Thailand; South Vietnam; the former Regional Pulse Improvement Project; the USDA Plant Introduction Station, Experiment, Georgia; and other sources. Data were obtained on yield, days to flower, days to first ripe pod, height, branch length, pods per plant, seeds per pod, 1000-seed weight, virus and mildew incidence. All data has been

collected and tabulated and will be printed in a UMC, Department of Agronomy, Miscellaneous publication which will be made available to mungbean research workers.

Plot land and other resources did not permit us to grow all of the strains from the USDA Plant Introduction Station. Since June several hundred additional collections of mungbean strains have been received by us and the USDA from Thailand, Philippines, Taiwan, Nigeria, Peru, and other sources. These will exceed our facilities for evaluating them in 1974. However, we expect to continue the evaluations as rapidly as resources permit.

Objective 2 (To conduct an international mungbean screening nursery)

The Second International Mungbean Nursery was grown in 1973. Seed of 28 strains were sent to 25 cooperators in 14 countries on four continents. Data from cooperators is now being received. The data from the various nursery locations will be collated and published.

The First International Mungbean Nursery was grown in 1972. It was planted at 10 locations in seven countries ranging from 3° to 47° N latitude. An important observation was made regarding the photoperiod response of the mungbean growing in different latitudes. When grown in short days of the low latitudes, little or no differential response of the varieties to flowering was noted, but with the longer days at higher latitudes a wide range in number of days to flowering among varieties was observed. This information is useful in determining the adaptation of a strain of mungbeans to production areas differing in latitude, or to the adaptation of a strain to different seasons of the year.

Objective 3 (To conduct research on breeding problems)

The differential response of mungbeans in long photoperiods and the lack of a differential response in short photoperiods, noted in the international mungbean nursery, have been confirmed in controlled plant environmental chamber studies. These studies were initiated before this contract was started and the first report has been prepared for publication. The photoperiod studies are being continued through employment of a one-quarter time graduate research assistant on contract funds. It is also planned to study the thermal-response of different mungbean strains.

F. Dissemination and Utilization of Research Results

1. Genetic evaluation of germplasm.

The results of mungbean strain evaluation trials at Columbia in 1970, 1971, and 1972 have been printed and distributed widely to mungbean research workers throughout the world. USAID has aided in distributing the published results. Request for these publications continue to be received from mungbean research workers in both LDC and 'developed' countries. When visiting research stations in the Philippines, or Thailand, I have had the research officer show me copies of these reports which he

is keeping for reference. Requests continue to be received for seed of specific strains which further indicates the utilization of data from our studies on the genetic evaluation of germ plasm.

2. International Mungbean Nursery

The results of the First International Mungbean Nursery is being published as Missouri Agricultural Experiment Station Special Report 184 and will be promptly and widely distributed. Results of the Second International Mungbean Nursery will be published when all of the data is available.

A major benefit to be derived from the international nurseries is the exchange and dissemination of germ plasm as well as information on their potential yield and adaptation. Only strains from our nursery were included in the First International Mungbean Nursery which was sent to nine mungbean research workers. In the Second International Mungbean Nursery we included new strains contributed by research workers in Iran, India, South Vietnam, Thailand, Philippines, and Canada. This increases the diversity of the germ plasm available to all who grow the nursery.

It is of interest also to note that all of the cooperators who grew the first nursery in 1972 elected to grow the second nursery in 1973. In addition, requests for nurseries were received from research workers in Canada, U.S.A., Honduras, Ethiopia, Pakistan, S. Vietnam, Thailand, and other countries so that the number of cooperators to whom seed was sent was increased from 10 to 25.

A paper on the First International Mungbean Nursery was presented to the International Programs Division of the American Society of Agronomy at its annual meeting in November, 1973.

3. Research on Breeding Problems

A manuscript has been prepared and submitted for publication on the photoperiod studies of the mungbean. Although it is too early to assess the full utility of these studies, we believe they are an important step for a better understanding of where specific strains of mungbean may be adapted.

4. Other

Dr. David MacKenzie, plant breeder in charge of the mungbean breeding project of the Asian Vegetable Research and Development Center (AVRDC), Tainan, Taiwan, visited Columbia in September to observe our mungbean nursery and to confer on mutual research problems. Our project will be cooperating closely with AVRDC in exchange of germ plasm and information in order to avoid duplications of effort.

A chapter on mungbeans in a publication being prepared by AID was edited by the Principal Investigator on this project. Also, a scheme showing the International Mungbean Research Network was developed.

F. Expenditures on this contract for the period May 14 through December 31, 1974.

Salaries and Wages: \$4,138.42

Travel: \$465.62

Equipment, Supplies and Services: \$849.87

G. Work Plan and Estimated Budget

1. Genetic evaluation of germ plasm

We have several hundred new mungbean strains which have been received since June, 1973, and which will be evaluated insofar as our resources permit. Other strains have been received by the USDA Plant Introduction Station, Experiment, Georgia, which we have not yet evaluated, but which will be done as fast as we can move forward on this portion of our research.

2. International Mungbean Nursery

Plans will be completed and seed distributed for the Third International Mungbean Nursery by April, 1974.

3. Research on Breeding Problems

Plant environmental chamber studies are in progress to investigate the differential interaction of photoperiod and temperature on mungbean strains. This research will be based on the cycling of the materials through five photoperiods at three temperatures and will require about two years time to complete the study.

Some problem areas which need attention and should be given high priority relate to the ideal plant type and to viral diseases.

4. Other

Travel is planned in January, 1974, to visit Puerto Rico to confer with Dr. Julio Bird and other University of Puerto Rico and Federal Experiment Station staff on viral diseases of related legumes and to explore the possibility of cooperative research on these problems. CIAT and ICA will be visited in Colombia. The latter is a cooperator with the International Mungbean Nursery. The mungbean production area in Peru will be visited with Dr. Oswaldo Voysest V, Grain Specialist in the Peru Ministry of Agriculture. Peru is the second largest importer of mungbeans into the U.S.

If possible, the mungbean breeding program being developed by Dr. MacKenzie at AVRDC will be visited in April and cooperation with this new international research institute strengthened.

BUDGET

Item	5/14/73 to 12/31/73	1/1/74 to 5/13/74	5/14/74 to 5/13/75	Totals
Salaries and Wages	\$4,138.42	\$3,000.00	\$6,350.00	\$13,488.42
Travel	465.62	3,000.00	3,500.00	6,965.62
Supplies, Equipment, and Services	849.87	1,000.00	2,696.09	4,545.96
	\$5,453.91	\$7,000.00	\$12,546.09	\$25,000.00