รายงานผลการวิจัยโครงการปรับปรุงพันธุ์และวิธีการปลูกพืชผักต่าง ๆ ของกองการค้นคว้าทดลองกรมกสิกรรม (พ.ศ. ๒๕๐๗ – ๒๕๐๘)

Summary Report of the Varietal and Cultural Improvement Research Projects on Vegetable Crops, 1964-65

Slearmlarp Wasuwat [1]
Bangkhen Agricultural Experiment Station

The program of research on varietal and cultural improvement of vegetable crops consist of investigations on techniques of selection and seed production of some vegetables that we have to import their seeds. Crops under studied at the present are Chinese radish, Chinese kale and edible podded peas. Major researches on other crops include garlic, onion, potato, tomato, watermelon and cantaloupe. Principal research policies on garlic, onion and potato are the improvement of production and storage; whereas in tomato, studies on resistant varieties to diseases are undertaken. Some works on the control of diseases of watermelon and cantaloupe in cooperation with the Kasetsart University and the Plant Science Division of the Department of Agriculture have also been included in the Projects.

None of the technical staffs of the projects worked only on single vegetable; they must share their effort in other crop research due to the limited number of technical staffs of the division. Therefore, it became impossible for them to concentrate their efforts on any single problem in order to acquire specific knowledge and skill. Misinterpretation and inadequate planning of some experiments could have occurred. Any suggestions from the readers would be very welcome.

CHINESE RADISH

1. Varietal Studies.[2]

Two types of Chinese radish mostly grown in Thailand are the slicing type (early varieties) and the pickling type (late varieties). The slicing type can be grown all year round whereas the pick-

1 Project Leader, Varietal and Cultural Improvement of Vegetable Crops, Department of Agriculture.

2 The work was done by Inson Klongarngarn, Rachanee Boonnag and Nimitr Muttamara.

ling type has been grown only in winter. Since the crop is highly cross-pollinated and most of the seed have been imported, varietal purity studies are needed in order to compare the standard seed produced by the Department of Agriculture with the seed imported by local dealers.

Ten samples each of slicing and pickling radish seed, the sampling of which was made from various dealers in Bangkok, were grown at Bangkhen Agricultural Experiment Station together with a slicing variety and a pickling variety produced by the Department of Agriculture. The purity was determined by comparing the variation of leaf characteristics as studied in the previous year, namely, the late pickling type is correlated with spiny and hairy leaf, the early slicing type is correlated with glabrous leaf. The slicing variety produced by the Department of Agriculture was found to have 84 percent glabrous leaves. The pickling type produced by the Department of Agriculture was found to have 84 percent spiny and hairy leaves. Both of them ranked second in each type studied. Nine of 20 seed samples from the dealers possesed characteristics of mixture type. Further detailed studies on the relation of leaf and root characteristics are required.

2. Preliminary Study on Seed Production in the Early Variety of Chinese Radish. [3]

The purpose of this work was to study the actual seed production in relation to the rogueing percentage and the chemical spray in controlling insect pests during the period of pollination at Majoe Agricultural Experiment Station.

Lavae of the diamond-back moth have been found to be the most serious pest of radish at all stages of growth. In previous studies chemical spray was ceased during the period of pollination in order to provide a period for insect pollination. The seed crop has failed because of the diamond-back moth. Spraying malathion once a week in all stages of growth this year was found to be very successful. Rogueing percentage was still as high as 50 percent but varietal purity seemed to be somewhat improved. It is believed that, during the next few years the rogueing percentage will be reduced down to the point where the seed crop could be produced profitably.

3. Performance Studies of Early Varieties of Chinese Radish. [4]

The variety produced by Majoe Agricultural Experiment Station together with other 10 varieties from dealers were grown to compare their productivity at Bangkhen Agricultural Experiment Station. Two varieties from the dealers yielded better than Majoe's variety with the root production of 3,500 kilograms per rai (0.4 acre). No statistical differences exist between the Majoe's and other varieties. Their production ranged from 2,400 to 2,900 kilograms per rai. Results demonstrated the same yielding ability for the Department's variety and most of the varieties distributed by dealers.

3 The work was done by Manit Leerahachiwa, Amnuay Manit and Amnuay Vardhanavasin.

4 The work was done by Inson Klongarngarn and Nimitr Muttamara.

4. Selection and Seed Production of a Late Variety Chinese Radish.[5]

Works carried out at Fang Agricultural Experiment Station were divided into two plots. The first plot was for selection and maintenance of stock seed. Seed crops were harvested only from the plants that had leaf characteristics of pickling variety, large-straight roots. All the rests were disposed of before flowering. Seeds of this crop will be saved for further selection and used for the production of the foundation seed the following year.

The second plot, 100-meter isolated from the first plot, was grown one month later for the production of foundation seed. Medium to large straight rooted plants with spiny and hairy leaves were kept for seed production. All the rests were rogued out before flowering. About 100 liters of foundation seed produced will be released to the Extension Division for use in the production of distribution seed through contracted farms.

5. Performance Studies of Late Varieties of Chinese Radish.[6]

The comparison of productivity of a late variety of Chinese radish produced by Fang Agricultural Experiment Station with 10 varieties from local dealers in Bangkok were performed at Bangkhen Agricultural Experiment Station. Results indicated the need for further improvement of variety produced by Fang Experiment Station since this variety produced lower yields than most of the varieties distributed by the dealers.

CHINESE KALE

1. Varietal Studies.[7]

Results from the previous work provided information concerning plant characteristics of the early or branching type and the late or leafy type of Chinese kale grown in the country. The study carried out this year was designed to investigate the varietal purity of imported varieties distributed by dealers as well as varieties produced locally by the Department of Agriculture.

Four leafy type varieties and 10 branching type varieties from different dealers in Bangkok together with a leafy variety produced by Fang Agricultural Experiment Station were grown at Bangkhen Agricultural Experiment Station. More than 400 plants of each variety were examined for their characteristics. Percentage of plants possessing leaf characteristics toward the leafy or branching type was recorded. Purity of branching varieties from the dealers ranged from 94 to 100 percent whereas the leafy type were found to be only 65 to90 percent pure. The variety produced by Fang Experiment Station ranked second among the leafy type which demonstrated the same standard as the imported varieties.

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5 The work was done by Somboon Yuwawan and Manop Pawakul.

6 The work was done by Inson Klongarngarn and Nimitr Muttamara.

7 The work was done by Nimitr Muttamara, Rachanee Boonnag and Inson Klongarngarn.

2. Preliminary Studies on Seed Production of a Branching Variety of Chinese Kale.[8]

Problems on seed production studies on Chihese kale at Majoe Agricultural Experiment Station are similar to those of Chinese radish, namely, the culture and the epidemic of diamond-back moth. Chemical spray to control this insect using malathion once a week was the most effective with little effect on insect pollinators. Downy mildew was also a serious disease here but, under the current trial, could be controlled by spraying maneb, zineb and cupravit alternately every week. However, the production was somewhat low due to low soil fertility. Seed yields obtained averaged only 100 liters per rai. Soil fertility improvement is needed here for any increase of seed production.

3. Performance Studies of the Branching Varieties of Chinese Kale.[9]

Ten varieties of branching Chinese kale were tested for their performance at Bangkhen Agricultural Experiment Station to find the general yielding ability of varieties distributed within the country. Over 70 percent of the varieties produced more than 3,000 kilograms of fresh vegetable per rai. Only a few varieties differred statistically on yield, particularly among those that produced less than 3,000 kilograms per rai.

4. Selection and Seed Production of a Leafy Variety of Chinese Kale.[10]

The leafy variety of Chinese kale developed at Fang Agricultural Experiment Station has been found to be the best when comparing with the varieties distributed by dealers. Thus, besides the selection and maintenance of stock seed, the work was extended to the production of foundation seed.

In the selection and maintenance of stock seed, only plants that were practically disease-free, higher in numbers of leaves (more than 10), having short internode, white flower and true-to-type were selected for seed crops. In the production of the foundation seed, rogueing out the off-type and diseased plants were undertaken. All undesirable plants in both works were destroyed before flowering.

Only 8 percent were rogued out this year, indicating the improvement of varietal purity when compared to 28 percent being done in the previous season.

5. Performance Studies of the Leafy Varieties of Chinese Kale.[11]

Five varieties of leafy kale from dealers in Bangkok and from Fang Agricultural Station were compared for their yielding ability at Bangkhen Agricultural Station. Results confirmed those found previously that the variety produced by Fang Experment Station had

8 The work was done by Manit Leerahachiwa and Amnuay Manit.

9 The work was done by Nimitr Muttamara and Inson Klongarngarn.

10 The work was done by Manop Pawakul and Somboon Yuwawan.

11 The work was done by Nimitr Muttamara and Inson Klongarangarn.

reached the quality standard of the market. Statistically, there was no difference in yield capability among varieties tested. Their productivity ranged from 3,600 to 4,000 kilograms per rai.

EDIBLE PODDED PEA

1. Preliminary Study on Seed Production of the Early Variety of Edible Podded Pea.[12]

Previous investigation indicated that root rot diseases, rust, poor soil fertility were the major causes of failure of the pea seed production at Majoe. Since the soil there is slightly acid and low in organic matter, a modification of the ordinary culture was employed consisting of the use of seed treatment in controlling root rot, the addition of urea above the 10-10-10 kilogram per rai of regular fertilizer, and the control of rust during the later stage of growth by weekly spray of wettable sulfur. Results obtained were promising. The seed crop produced 100 liters per rai. Effective control of the diseases and the proper use of fertilizer seem to be the major factors in solving the problems.

2. Selection and Seed Production of the Late Variety of Edible Podded Pea.[13]

The twin pods per cluster variety developed at Fang Agaicultural Experiment Station was found to be superior to local varieties distributed by dealers in two trials in 1963 and 1964. The production of the foundation seed was carried out. Seeds from twin-pod plant were selected as elite seed and those from disease-free pods were selected as foundation seeds. Foundation seed yielded about 100 liters per rai.

3. Performance Studies of Edible Podded Pea Varieties.[14]

The early and late varieties of edible podded pea produced by Majoe and Fang Agricultural Experiment Stations were on trial together with eight varieties from local dealers at Bankhen Agricultural Experiment Station. Varieties produced by both stations possessed better quality by having less seed-borne diseases. They were more uniform than the best of varieties from dealers. The late variety from Fang Experiment Station has already been multiplied as the foundation seed. The extension seed will be produced next season through contracted farms organized by the Division of Extension Service, Department of Agriculture.

ONION

1. Introduction and Observation of Onion Varieties.[15]

Two onion varieties, namely, *Granex* and *Yellow Burmuda* are standard varieties cultivated mostly in northern region of Thailand. Besides the earliness characteristic, the two varieties are also susceptible to the purple blotch and leaf mold, two predominant diseases of onion in the region. In most cases, the diseases have caused onion plants to die immaturely, and reduced the storage ability of the harvested crop.

Nine more varieties were introduced for trial at Fang and Majoe Agricultural Experiment Stations in order to find

12 The work was done by Manit Leerahachiwa and Amnuay Manit.
13 The work was done by Manop Pawakul and Somboon Yuwawan.
14 The work was done by Nimitr Muttamara and Inson Klongarngarn.
15 The work was done by Somboon Yuwawan, Manop Pawakul, Boonlerd Kaow-orn, Manit Leerahachiwa, Amnuay Manit and Amnuay Vardhanavasin.

the varieties that thrived better than the two standard varieties. Varieties under trial included *Granex*, *Excel 986*, *Texas*, *Early Grano 502*, *Texas Early Grano*, *New Mexico White Grano*, *Red Creole*, *Excel*, *Red Globe*, *Yellow Burmuda*, *Hamek Egyptian Improved*, and *Early Harvest No. 5*. There were no varieties that yielded better than Granex which produced 3,500 kilograms of fresh onion per rai. The variety Early Harvest No. 5 and Hamek Egyptian Improved tolerated the diseases somewhat but failed to produce bulb.

2. Studies on the Storages of Onion Varieties.[16]

Storage ability of onion varieties grown in 1963 were studied at Majoe Agricultural Experiment Station. *Red Creole* and *Early Rocky Brown* were the two best varieties in storage. After 4 month storage, about 70 percent of edible bulbs remained, compared with 55 percent for the Granex.

Economic study showed that if farmers could store onion properly up to 4 months, the net income would be about 3 times as much for Red Creole and Early Rocky Brown and 2 times as much for Granex as the receipt right after harvest.

POTATO

1. Performance Studies of Potato Varieties.[17]

This is a third-year coordinated research program between the Institute for Research of Field Crops (I.V.R.O.) of the Netherlands and the Department of Agriculture of Thailand. Fourteen varieties of seed potato were sent for trials at the northern region of Thailand. These varieties were *Bintje*, *Up-to-Date*, *Ultimus*, *Desiree*, *Mentor*, *Extase*, *Arka*, *Zingstra*, *Pimpernel*, *Patrones*, *Alpha*, *Radosa*, *Spartaan* and *Multa*. The works were carried out at Majoe and Fang Agricultural Experiment Stations.

The objectives of the trials were to evaluate varieties resistant to the blight disease with better yield than the Bintje, a standard veriety grown mostly in the North. At Majoe, there were 5 varieties that yielded significantly better than Bintje, they were Multa, Mentor, Arka, Ultimus and Extase. At Fang, 5 varieties that yielded significantly better than Bintje were Mentor, Up-to-Date, Multa, Radosa and Alpha.

Zingstra was somewhat resistant to blight disease but this variety did not yield well under conditions here. Extase was a promising variety under the local conditions. Extase was a promising variety under this test both in yield and in moderate resistance to the diseases.

2. Studies on the Storage Ability of Potato Varieties.[18]

Eleven varieties and twelve varieties of potato tubers produced at Majoe and Fang Agricultural Experiment Stations, respectively, during the season of 1963-64, were tested for their storage

16 The work was done by Wan Chaikaew, Amnuay Manit and Amnuay Vardhanavasin.

17 The work was done by Manit Leerahachiwa, Amnuay Manit, Manop Pawakul and Boonlerd Kaow-orn.

18 The work was done by Wan Chai-Kaew, Manit, Amnuay Amnuay Vardhanavasin, Manop Pawakul, Boonlerd Koaw-orn, and Somboon Yuwawan.

ability beginning April 1964. At Majoe, the purpose of the study was mainly on the keeping quality of tubers for consumption. At Fang, the work was planned to study the storage ability of tubers for propagation.

At Majoe, after five-month storage, Spartaan, Desiree, Patrones, Extase, Pimpernel, Ultimus, and Up-to-Date exhibited a better edible quality than Bintje. Percentage of edible tubers remained were 89, 85, 81, 77, 77, 76, and 72 as compared with 44 percent left by Bintje. At Fang, practically all varieties began to sprout after two month storage, and sprouted completely a month later.

Potato tubers of all varieties except Mentor would attain a maximum price after three-month storage, about 3 times higher than what would be at harvest. After five-month storage the price of Spartaan variety would be about twice as much as that of Bintje if the same amount had been stored at the beginning.

TOMATO

1. Evaluation of Tomato Varieties Resistant to Blossom-End Rot.[19]

Tomato varieties tested during the winter of 1963-64 were evaluated again during the rainy season of 1964. In winter, 8 more varieties introduced from the United States. namely *Hentona, Grothern's Globe, Lana, Homestead, Jefferson, Roma, Zanmazano,* and *Sunray* were screened together with *Rutger* and *Molokai*, the two moderately resistant and resistant varieties tested in 1963-64.

Practically there was no disease apparent in the rainy season, but in winter diseased fruits were adequate for statistical analysis. The occurrance of the disease on Rutger and Molokai varieties were similar to the results found earlier. Thus, using these 2 varieties as a standard, four groups of tomato varieties evaluated this year were as follows:

1) Susceptible (50 to 74 percent diseased fruit). Varieties belonged to this group were Zanmazano and Sunray.

2) Moderately Susceptible (25 to 49 percent diseased fruit). The varieties Roma and Jefferson were classed in this group.

3) Moderately Resistant (10 to 24 percent diseased fruit). Varieties in this group were Grothern's Globe, Lana, Homestead, and Rutger.

4) Resistant (1 to 9 percent diseased fruit). Tomato varieties Molokai and Hentona were in this group.

2. Studies on the Control Measure of the Blossom-End Rot Disease of Tomato.[20]

A susceptible variety of tomato to the blossom-end rot disease, *Red Top Vr 29*, was used to study the incidence of the disease, and effectiveness of foliar spray of 0.02, 0.04, 0.06, and 0.08 molar calcium chloride solution which were sprayed twice a week beginning at the flowering stage. In this study, the blossom-end rot disease oc-

19 The work was done by Kwanyuen Wichapan, Nuchanart Hormchong and Slearmlarp Wasuwat.

20 The work was done dy Punee Hongsnoi and Slearmlarp Wasuwat.

curred on tomato fruits at any stage after fruit setting to maturity. Statistical differences among foliar spray treatments as compared to the control treatment were not significant. The experiment will be repeated next season since there were trends in this experiment that the calcium chloride spraying may reduce the severity of the diseases if susceptibility increases.

3. Studies and Survey of Major Diseases of Tomato.[21]

Incidence and severity of other diseases of tomato were studied at Bangkhen Agricultural Experiment Station both in the rainy and winter seasons of 1963-64. In rainy season, diseases caused by viruses were the major one. They were mosaics and leaf curl. The incidence found were as high as 32 percent. In winter, wilt, blight and virus diseases were three major diseases. The incidence of these diseases were as high as 38, 39 and 20 percent respectively.

WATERMELON

1. Incidence of the Blossom-End Rot Disease of Charleston Gray Watermelon and the Effectiveness of Calcium Application.[22]

Objectives and design of this work were similar to those of the blossom -end rot disease of tomato. However, the results were not successful due to the interferance of other diseases and insects that caused the plant to die before maturity of fruit. In regards to the incidence of the disease, about 45 percent of fruit set in control treatment contracted blossom-end rot.

CANTALOUPE

1. Studies on the Control Measures of Downy Mildew in Cantaloupe.[23]

Downy mildew has been a major disease of cantaloupe since the introduction of this crop into the country. At Bangkhen, it is impossible to cultivate the crop successfully without chemical spray to control the disease. Spraying cupravit twice a week has been a general control measure adopted during the last 5 years. The cost of chemical is cheap but the procedure is time and labor consuming. This experiment was designed to evaluate the new chemical fungicides and culture of cantaloupe for better economic production.

Maneb, zineb, captan and cupravit were included in the evaluation this year. Results demonstrated that the spraying of captan once a week at all stage of growth could control the disease effectively and was the cheapest investment in reference to the net profit earned.

สรุป

โครงการปรับปรุงพันธุ์และวิธีการปลูกพืชผักต่าง ๆ ในปีที่ผ่านมาคือ พ.ศ. ๒๕๐๗-๒๕๐๘ ของกองการค้นคว้าทดลอง กรมกสิกรรม ส่วนใหญ่เป็นการค้นคว้าเกี่ยวกับวิธีการคัดพันธุ์และการผลิตเมล็ดพันธุ์ผักต่าง ๆ ที่ต้องสั่งจากต่างประเทศคือผักกาดหัว คะน้า และถั่วลันเตาชนิดกินฝักนอก

21 The work was done by Nuchanart Hormchong and Slearmlarp Wasuwat.
22 The work was done by Sommai Tuladecharak, Udom Pupipat and Slearmlarp Wasuwat.
23 The work was done by Kwanthai Kung-udom and Slearmlarp Wasuwat.

จากนั้นได้ทำการศึกษาพันธุ์และคุณภาพในการเก็บถนอมของหอมใหญ่และมันฝรั่ง ทำการทดลองพันธุ์มะเขือเทศเพื่อศึกษาเรื่องความทนทานต่อโรคก้นจุด ตลอดจนการใช้แคลเซียมเพื่อป้องกันโรคนี้ และได้ทำการสำรวจและศึกษาโรคที่สำคัญ ๆ ของมะเขือเทศอีกด้วย นอกจากนี้ได้ทำการทดลองใช้แคลเซียมเพื่อป้องกันโรคก้นจุดของแตงโม พันธุ์ชาร์ลส์ตันเกรย์และเปรียบเทียบการใช้ยาต่าง ๆ เพื่อป้องกันโรคดาวนีมิลดิวของแตงฝรั่ง