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1) Observations and evaluation of *G. gracilis* and *G. soja* forms for crossing within the *Glycine* genus under climatic conditions in Poland.

Wild species of cultivated plants are well known to possess a high potential of adaptability manifested by high tolerance to unfavorable environmental conditions and to pathogens. They are often carriers of valuable biochemical properties. To have these properties transmitted to cultivated species would no doubt be advantageous from the point of view of agriculture. To this end, a thorough evaluation of wild forms should be made. At our Institute work was carried out on the variation range within the *Glycine max* species (Jaranowski et al., 1980) and on evaluation of wild forms of the *Soja* sub-genus for qualities valuable to genetic and breeding work under climatic conditions in Poland.

Materials: Seeds of *G. gracilis* and *G. soja* were kindly made available by Dr. R. Bernard, Urbana, Illinois, in 1975 and 1977, respectively. Samples of these two species were also received from the University of Morioko, Japan, in 1980. The batch of seeds from the Morioko University included 27 forms endemic to Japanese Islands, 18 from South Korea, two from Taiwan and one from the valley of the river Jangcy in China besides two forms, viz., PI 342,621A and PI 342,618, received from the Urbana Collection in the past. At

present, the number of plants totals 45 forms of *G. gracilis* and 111 forms of *G. soja* (Table 1).

Table 1

Number of *G. gracilis* and *G. soja* forms by origin

| Country of origin | *G. gracilis* | *G. soja* |
|---|---|---|
| China | 18 | 24 |
| Japan | 20 | 35 |
| Korea | 1 | 34 |
| USSR | -- | 16 |
| Taiwan | -- | 2 |
| Other | 6 | -- |
| Totals | 45 | 111 |

Seeds of *G. gracilis* were grown in the field in 1975-1977 and in 1980 while those of *G. soja* were potted under greenhouse conditions and the pots left outside the house during the day. Attention was paid primarily to phenological phenomena, morphological traits and fertility.

Results: The process of vegetation of *G. gracilis* and *G. soja* forms. The geographical range of wild and semi-wild soybean forms is wide (30°N - 40°N). Our observations of the length of growing period point to considerable differences with country of origin.

In the field the forms of *G. gracilis* flowered between the second and third weeks of July. The first flowers were produced on the 9-10 node. The length of the flowering period varied with particular forms from 25 to 40 days. Start on harvest of *G. gracilis* was made at the end of September. The first to mature were two forms, one from Japan (PI 81,765) and one of unknown origin (PI 189,866). Around the mid of October ten other forms matured, including four from Japan, three from Manchuria, China. From the total of 45 *G. gracilis* forms gathered, seeds were collected from 28 (Table 2).

In the greenhouse, *G. soja* forms flowered earliest in the second week of July. The first to begin flowering were two forms from the region of Primorsk (43°N). In the third week of July three forms were observed to start flowering, originally grown on the river Amur in the region of Chabarovsk (48.5°N). In general, the common date of onset of flowering was

the first and second week of August. The length of flowering period ranged from 20 to 35 days. Harvesting was usually conducted from the third week of September to the middle of November. Seeds were collected from 39 forms. The number of *G. soja* forms maturing in Polish climatic conditions is presented by country of origin in Table 2. It appears from the Table that as many as 75% forms from China produced seeds, i.e., four from Manchuria (above 41°N), from the neighborhood of Harbin in the province Heilungkiang, nine from the province Kirin, and three from the neighborhood of Shenyang in the province Liaoning. Almost all *G. soja* forms from the provinces below 35°N failed to produce a single seed. Of this zone, only two forms matured, viz., from the provinces of Chantung and Kiangsu.

Table 2

Number of maturing forms of *G. gracilis* and *G. soja* by country of origin

| Origin | *G. gracilis* | | | *G. soja* | | |
|---|---|---|---|---|---|---|
| | No. of forms | | % maturing forms | No. of forms | | % maturing forms |
| | Collected | Maturing | | Collected | Maturing | |
| China | 18 | 13 | 72.2 | 24 | 18 | 75.0 |
| Japan | 20 | 9 | 45.0 | 35 | 4 | 11.4 |
| South Korea | 1 | -- | -- | 34 | 2 | 5.8 |
| USSR | -- | -- | -- | 16 | 15 | 93.7 |
| Taiwan | -- | -- | -- | 2 | -- | -- |
| Other | 6 | 6 | 100.0 | -- | -- | -- |
| Total | 45 | 28 | 62.9 | 111 | 39 | 35.1 |

Forms of *G. soja* from the Soviet Union that reached maturity in Poland originated primarily from the region of Primorsk and Chabarovsk (43°N - 48.5°N). They included six forms from the region of Primorsk, four from the region of Vladivostok and three from the region of Chabarovsk. From the above zones, 93.7% forms matured (Table 2).

Of the large number of Japanese forms, only four matured in Poland (11.4%). Two of them were sampled in the neighborhood of Morioko (39.5°N) and two in

the Island of Hokkaido at Tokachi Plain. The remaining forms collected at lower latitudes initiated flowering late in September or did not set flowers at all. A similar response to long-day conditions was observed for *G. soja* forms from South Korea. Of the 34 forms collected, only two matured; they were from the neighborhood of Chunchon (39.5°N) (Table 2).

The two forms from Chabarovsk and Vladivostok, kindly supplied by Professor N. Kaizuna, were found to mature at the same time as their homologues received from Urbana. The forms from the valley of the river Jangcy (31°N) did not initiate flowering.

Morphology and yielding capacity of *G. gracilis* and *G. soja*: The *G. gracilis* plants of the examined population were more feeble than those of *G. max* and developed from 3 to 8 long branches. The plants were bushy, delicate and had thin light-brown hair on stems and leaves. Three of them were found to resemble the type of *G. max* plants. They had leaves longer than other forms of *G. gracilis*, dense hair and were of erect type. Two of them originated from Japan and one from Manchuria. The color of *G. gracilis* flowers was differentiated, from white to purple and dark violet. They grew closely together and generally formed five-flower-clusters or were observed in groups of two or three, settled at leaf axils. They varied in size. Nine forms produced relatively large flowers. Pods were smaller than in *G. max*, from light-brown to black in color, with 1-3 seeds per pod, averaged 2.2. The weight of 100 seeds was 5.7 g. From the maturing forms, approximately 36.0 seeds per plant were collected. Of the analyzed population, the Japanese form PI 81,765 matured earliest and produced the highest yield. Of interest from the breeding and genetic point of view were also other forms with satisfactory maturation and good yielding capacity, viz., PI 81,763, PI 81,768, PI 81,770 and PI 81,772 - all from Japan, besides the form PI 189,866 from an unidentified site.

The *G. soja* plants were characteristic of slender and feeble growth habit, with the height of the main stem reaching some 2.3 m at harvest. Flowers were small, from pink to violet. Pods were black and short. Exception to color were two light brown forms from the region of Primorsk (PI 342,619A and PI 342,619B). Seeds were small-sized, with the weight of 100 seeds approximating 1.9 g. The earliest forms set more than 50 pods per plant. The form PI 342,621C set generally 126 pods with 198 seeds and the PI 342,621B set 82 pods with 126 seeds. The two forms originated from the region of Amur,

Chabarovsk. Also, satisfactory maturation and good yielding capacity were noted for the form PI 342,621A from the same region and for three forms from the neighborhood of Primorsk, viz., PI 342,619A, PI 342,619B, and PI 342,622A.

Conclusions: (1) Of the 45 forms of *G. gracilis* and 111 forms of *G. soja* from various latitudes (30-40°N), 62.2% of *G. gracilis* plants matured in Poland (mostly from Manchuria) and 35.1% of *G. soja* (also from Manchuria, primarily from the provinces: Heilungkiang, Kirin, Liaoning and from the USSR, from Chabarovsk and Primorsk). (2) In the *G. gracilis* population the highest yield and earliest maturity was noted for five forms from Japan and one from an unidentified site. (3) In the population of *G. soja*, the earliest maturity and highest yields showed forms from the region of Chabarovsk and Primorsk.

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1) A report on induced mutations for soybean rust resistance*

Soybean is an important food legume in Thailand. Three recommended varieties, namely 'S.J.1', 'S.J.2' and 'S.J.4', are commonly used at present. These varieties are susceptible to rust, caused by *Phakopsora pachyrhizi* Syd., which is one of the serious soybean diseases in Thailand, especially when soybeans are planted in the wet season. Sources of resistant genes in existing germplasm collections were reported (Bromfield and Yang, 1976; Yang, 1977b). Some of these collections were tested in Thailand and were identified as either good to moderate tolerance (Pupipat, 1977) or susceptible (Nundhapun and Surin, 1977).

This paper reports a result on induced mutations for rust resistance in soybean by using gamma radiation.

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