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Chickpea and Pigeonpea Meetings

Future Research Priorities for Chickpea and Pigeonpea Improvement

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Chickpea (*Cicer arietinum*) and pigeonpea (*Cajanus cajan*) are important grain legumes for the resource-poor farmers in the semi-arid tropics. More than 95% of the global area under these crops is in the developing countries. The potential grain yield of these crops is 4 to 5 t ha^{-1}, but the global average yield ranges between 0.6 and 0.8 t ha^{-1}. These crops are largely grown rainfed under low-input conditions and their productivity is constrained by various biotic and abiotic factors.

The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) and its partners [the national programs, advanced research institutes, non-governmental organizations (NGOs), private sector, and farmers] are committed to attain sustainable increases in the productivity potential of these legumes. The research and development priorities at ICRISAT have been dynamic and are guided by the changing scenario of the farming systems, the needs of the farmers and consumers and the development of improved technologies. The research priorities are revisited periodically through discussions with national program scientists, extension personnel, farmers, consumers and industry, and the feedback received is used in refining or redefining the research priorities for the future.

ICRISAT organized an International Chickpea Scientists' Meet during 16 to 17 January 2003 and an International Pigeonpea Scientists' Meet during 13 to14 November 2003 at Patancheru, India. Thirty scientists from Australia, Bangladesh, Canada, Ethiopia, India and Nepal and 14 scientists from ICRISAT participated in the Chickpea Scientists' meeting. Fifty scientists, including 12 from ICRISAT, 32 from India, and one each from China, Myanmar, Nepal, Sri Lanka, UK and USA participated in the Pigeonpea Scientists' meeting. The objectives of these meetings were to: (i) visit the research experiments at ICRISAT; (ii) provide opportunity for scientists to select germplasm and breeding material; (iii) exchange information among scientists from various national programs and ICRISAT; and (iv) identify future research thrusts and priorities for research globally.

Representatives from the participating countries presented the current status and future research thrusts for chickpea and pigeonpea in the respective national programs. Major priority areas of research for these crops in different countries are summarized in Table 1. Group discussions were subsequently held to prioritize research thrusts across countries. Each scientist gave a scoring or priority, based on the local, national or global importance of the constraints and the need for future research. The chickpea and pigeonpea groups identified the following future research thrusts.

Chickpea

1. Pyramiding of genes for resistance to major insect pests (*Helicoverpa* pod borer) and diseases (ascochyta blight and botrytis gray mold), for which levels of resistance are not high in the cultivated germplasm
2. Incorporation of drought, heat and cold tolerance traits as per needs of the national programs
3. Identification of diverse germplasm sources for important economic traits
4. Development of transgenics for resistance to pod borer, ascochyta blight, botrytis gray mold and chickpea stunt
5. Integrated pest management (IPM), including biological control agents
6. Accessing desirable genes from wild species (through tissue culture, embryo rescue, etc)

Table 1. Major priority areas of chickpea and pigeonpea research in different countries[1].

Priority areas for research	Countries
Chickpea	
Tolerance to drought and cold and development of short-duration varieties	India, Pakistan, Bangladesh (except cold tolerance), Nepal, Ethiopia, Australia, Canada
Resistance to *Helicoverpa* pod borer and integrated management	India, Pakistan, Bangladesh, Nepal, Ethiopia, Australia
Resistance to fusarium wilt	India, Pakistan, Bangladesh, Nepal, Ethiopia
Resistance to ascochyta blight and integrated management	India, Pakistan, Ethiopia, Australia, Canada
Resistance to botrytis gray mold and integrated management	India, Bangladesh, Nepal, Australia, Canada
Resistance to phytophthora root rot	Australia
Exploitation of wide crosses, transgenics, and marker-assisted breeding	India, Australia, Canada
Improved seed systems	Ethiopia
Pigeonpea	
Resistance to *Helicoverpa* and *Maruca* pod borers, podfly and bruchids	India, Nepal, China, Myanmar, Sri Lanka
Resistance to fusarium wilt	India, Nepal, Myanmar
Resistance to sterility mosaic	India, Myanmar, China
High fodder yield or dual-purpose varieties	China, India
Integrated pest management	India, Nepal, China, Myanmar
Exploitation of hybrid vigor for yield and stability	India
Exploitation of wide crosses, transgenics and marker-assisted breeding	India

1. Includes countries that were represented in International Chickpea Scientists' Meet, 16–17 January 2003 and International Pigeonpea Scientists' Meet, 13–14 November 2003 organized at ICRISAT, Patancheru, India.

7. Marker-assisted selection to hasten breeding cycles
8. Development of short-duration varieties for escaping drought and fitting the crop in narrow windows in some cropping systems
9. Improved seed systems (seed villages, community seed banks, etc)
10. Integrated water and nutrient (nitrogen, phosphorus, micronutrients, biological nitrogen fixation) management

Pigeonpea

1. Resistance to major insect pests (*Helicoverpa* and *Maruca* pod borers, and podfly) and diseases (fusarium wilt, sterility mosaic, phytophthora blight, alternaria blight and phoma stem canker)
2. Development of IPM strategies for management of the above stresses, including use of biological control and biopesticides
3. Development of transgenics for pod borer

4. Introgression of genes from wild *Cajanus* species
5. Development of dual-purpose (fodder and grain) varieties and hybrids

Conclusions

It is obvious that there are some common high priority areas, while some reflect the local/regional research priorities. For obvious reasons, some of the constraints in certain countries or regions may not have high priority or were not reflected in the global research priorities. These need to be addressed by the local/national programs, as per the need. Even then, the priorities for global research for chickpea and pigeonpea are many. The limitation of resources (both human and financial) may not allow ICRISAT to address all the priority research areas. However, considering that we are all committed to partnerships, ICRISAT will attempt to facilitate research collaboration among interested institutes/scientists, so that major priority areas that are important across major producing countries will be addressed adequately.