Recent Advancement in Soybean Cultivation -Review

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Abstract- **Soybean is a rich source of edible oil containing no cholesterol and almost none of the saturated fats. Soybean oil surpasses all other oils because it is a ideal and typical food for heart patients and those who wish to avoid heart disease. The paramount value about soybean is being discussed in this review.**

Index Terms- **Soybean, Edible Oil, Food, Diseases**

I. INTRODUCTION

Soybean has identified as one of the premier agricultural crops today for various reason. Soybean is a major source of vegetable oil, protein and animal feed. Soybean, with over 40 percent protein and 20 percent oil, has now been identified all over the world as a potential supplementary source of edible oil and nutritious food(Liu et al.,1997). The protein of soybean is known a complete protein, because it supplies sufficient amounts of the kinds of amino acids required by the body for building and repair of tissues. Its food value in heart disease and diabetes is well known. It is important that Chinese infants using soybean milk in place of cow's milk are practically free from rickets. It also contains a large amount of lecithin and a fair percentage of fat-soluble vitamins(Okagbare et al.,2006). Lecithin is a significant constituent of all organs of the human body and especially of the nervous tissue, the heart and liver. Soybean is, therefore, a good food. Besides its nutritive quality, functional features of soy protein have opened avenues for producing new products and improving the quality of existing standard food products.

ECONOMIC SCENARIO OF SOYA BEAN

A series of soy based industries has emerged in the USA. Oil is extracted for human consumption and industrial uses, and defatted soy meal is transformed into various protein rich foods and feed products. India has also entered this soybean development race, although the experience of India a potential soya producer in this race is not even of two decades. Soybean is not a new crop to India(Potter et al.,1995). It was cultivated in India long before it was introduced to the USA in the early 1800s. Black soybean has been grown for ages ,erstwhile in low Himalayan hills as well as in the foothills and some scattered pockets of central India. Soybean was primarily used as a pulse by the local people, and the green and dried vegetative parts were used as forage for cattle. The crop had never become popular on the Indian subcontinent or in other tropical countries until recently. While the importance of soybean as a commercial crop with immense potential for food and feed has been well recognized by developed countries, developing countries (including India) have delayed the development of this crop(Makkar et al., 1996). In India, which is dominantly a vegetarian society, fats and proteins of vegetable origin acquire special significance. Since soybean is both an oilseed and a pulse crop and India has been struggling hard to bridge the oil and protein gap, fresh attempts were started in the 1960s to explore the possibility of developing soybean as a commercial crop in the country. It was identified that production of soybeans would increase farm income and provides a cheap, additional supply of high quality protein suitable for human consumption as well as badly needed edible oil. Many forces were operative in motivating India to be an active participant in the soybean development race since the beginning of the 1970s. Even though India's share in the world's whole area under soybean is about one percent at present, advancement as well as the expansion of this crop in the country during the last 15 years is rated as one of the striking occurrences in the agricultural development process. Area under soybean in India had leaped from about thousand hectares in 1971-72 to about 814 thousand hectares in 1983-84, marking a twenty fivefold increase(Prodanov et al.,2004).

SOY BEAN: YIELD, STABILITY, MATURITY

Yield is a significant characteristic to consider when selecting a soybean variety. It is not unusual for one variety to out yield another variety by 5 to 15 bushels in the same environment. Although improvements in yield do not occur at a sporadic pace, a recent evaluation of genetic improvement of soybean varieties in Kansas recognized the development of improved varieties represented an increase in yield of about one-third of a bushel per acre per year. To make the best possible decision regarding yield potential, gather as much variety performance information as possible(Ragab et al.,2010). Since the performance of any variety differs from year to year and from location to location depending on factors such as weather, management practices, and variety adaptation, consider the performance of a variety across multiple locations for multiple years. An average across years and locations provides a better estimate of genetic potential and stability than a single site or only a few test sites. Furthermore, the selection process is complicated by the many new soybean varieties entering the market each year, while others leave the market. For varieties new to the market, where information across years is limited or unavailable, analyzing performance across locations is especially important.

Maturity

Maturity must be closely assessed for the production environment and the cropping system. Maturity strongly influences how plant development complements or is affected by weather conditions. While environmental criterias such as heat affect physiological development, soybean plants also are sensitive to day length or photoperiod(Sharma et al.,2011). Because of this sensitivity, the timing of the transition from vegetative to reproductive or floral development phases and the rate of physiological development are primarily influenced by the photoperiod or day length requirements. Varieties differ in their responses to day length. Some varieties flower under relatively short days (longer nights) while others flower under longer days (shorter nights). Varieties have been categorized for photoperiod response based on the ability of the variety to effectively use the length of the growing season in a region. During the summer, daylight hours increase from the southern to northern United States.

Fungal Diseases Soybean Rust

Infected leaves have small tan to dark brown or reddish brown lesions. From the lesions,minor raised pustules or bumps can occur on the lower surface of the leaves. Chronic infection leads to premature defoliation and can cause high yield losses. Purple seed stain: Infected seeds show pink or purple spots or become entirely pink or purple. The seed coat often cracks. When infected seeds are planted, the fungus grows and penetrates into the seedling leaves and stems and produces spores. The spores are spread by wind and rain splash and in turn infect leaves, stems and pods of other plants(Suda et al.,1995).

Bacterial diseases Bacterial blight

When plants are infected early in the season they may be stunted and die. Symptoms in later growth phases consist of angular lesions, which begin as small water soaked yellow to light brown spots on the leaves. The centres of the spots will turn a dark reddish-brown to black and dry out. Water soaked tissue then surrounds and floods the lesions and is bordered by a yellowish-green halo. Subsequently the lesions will fall out of the leaf. The disease spreads during windy rainstorms and during cultivation while the foliage is wet. The bacteria are carried over in crop debris and in infected seeds. Seeds commonly do not show symptoms. Bacterial Pustule: Symptoms first look like those of bacterial blight. Small yellow-green spots with reddish-brown centres occur on the leaves(Sharma et al.,2011). Usually, small raised pustules appear from the centre of the lesions. The presence of a pustule and the absence of water soaked parts differentiates bacterial pustule from bacterial blight. In a later stage, the small lesions may connect and form large, irregular, cracked, brown areas with a yellow margin. The disease is seed borne and the bacteria causing the disease over-season in diseased crop debris.

Herbicide-Resistant Soybean Technologies

Various herbicide resistant soybean technologies are currently on the market, and others will likely be introduced in the future. Planting herbicide-resistant soybeans caters additional weed-control options, but it also can increase the complexity of management. It is crucial to keep accurate records and communicate clearly with your herbicide applicator regarding herbicide-resistant traits within fields to make sure fields are not sprayed with the wrong herbicide. Spray drift and tank contamination on fields with different herbicide-resistant traits are other potential concerns. Regardless of the herbicide-resistant trait, the most efficient weed-control programs are integrated approaches with multiple weed control methods and diversified herbicide treatments(Torres-Penaranda et al.,2001). Availing a more diversified weed management program helps minimize the development of herbicide-resistant weed populations by reducing the reliance on a single herbicide or herbicide site of action. Glyphosate-resistant marestail is general throughout Kansas and ALS-resistant marestail also is present. Marestail generally acts as a winter annual, but it also can germinate in the spring and summer and behave like a summer annual. Marestail needs to be regulated before planting soybeans because there are no dependable herbicides to control it after soybeans have emerged. Dicamba, 2,4-D, Canopy EX, Autumn Super, Sharpen, and Valor XLT can all have perfect activity on marestail when applied in the fall or early spring. Treatments are most effective before marestail starts to bolt; dicamba or 2,4-D are usually recommended in the tank-mix for improved control. Dicamba has been more effective than 2,4-D in research at Kansas State University. Always follow the recommended preplant periods on the herbicide label to avoid potential crop injury. Liberty herbicide is one of the most effective herbicides to control marestail after it starts to bolt(Roy et al.,2010). Liberty can be availed as a burndown treatment before emergence of any soybeans or as a postemergence treatment in Liberty Link soybeans. The most effective postemergence treatment for glyphosate-resistant soybeans is glyphosate plus FirstRate or glyphosate plus Synchrony. Marestail will not be controlled with this treatment if the population is resistant to both glyphosate and ALS herbicides. Waterhemp and Palmer amaranth are both pigweed species that can be quite competitive with soybeans, have developed resistance to glyphosate, and are extremely difficult to control post emergence with other herbicides. Many waterhemp and Palmer amaranth populations are ALS-resistant and some are triazine resistant. The pigweeds are warm-season summer annuals do not start to germinate until late spring, but they can continue to germinate throughout the summer. Pre emergence herbicides with good residual pigweed activity are critical to control pigweeds(Young et al.,1990).. Several preplant and preemergence herbicides can provide good pigweed control, including Valor based products, Authority based products, and Prefix. The acetamide herbicides such as Dual Magnum, Outlook, Warrant, and Zidua also can provide good control, but usually are not as effective as the previously mentioned products. In no-till, sequential, or split applications of residual herbicides, early preplant and at planting or early postemergence applications generally provide the most consistent pigweed control. If applied too early in the spring, early preplant herbicides will not persist long enough to control later germinating pigweeds. The only post emergence herbicides that can provide control of pigweeds are PPO-inhibiting herbicides such as Cobra, Flexstar, Marvel, and Ultra Blazer. All of these products can provide good control when applied to small pigweeds, but control decreases dramatically after pigweeds exceed 3 inches tall, especially for Palmer amaranth. Most of these herbicides also provide some residual pigweed control, so early postemergence applications are critical for successful results(Tripathi et al.,2011). Waterhemp resistance to these herbicides also has been confirmed in Kansas, which further stresses the need for a good preemergence herbicide program. Several residual herbicides such as Outlook, Warrant, and Zidua can also be included as a tank-mix in postemergence herbicide applications to serve additional residual pigweed control later in the season. Liberty Link soybean programs may be a good option in fields with known glyphosate-resistant pigweeds, but still need to be a segment of a sequential weed control program with a good preemergence treatment followed by timely applications of Liberty to be effective. Kochia is an early-germinating summer annual weed that is primarily a problem in western Kansa(Torres-Penaranda et al.,2001). Glyphosate- and ALS-resistant kochia are fairly common throughout the western third of the state. Some triazine-resistant kochia is present as well. Kochia begins to germinate in March, and a main of the kochia has often germinated by the end of April. Consequently, controlling the first flush of kochia before planting soybeans is important. Early spring treatments that include Authority products, metribuzin, Kixor products, or dicamba are probably the best herbicide options for control of the early-emerging kochia(Wang et al.,1997).

Soybean Genomic Research Strategic Plan, 2012-2016

National Plant Genome Initiative, which is coordinated by the Interagency Working Group on Plant Genomics, Committee on Science, National Science & Technology Council. Implementation of a coordinated strategies for research & development of genomics across the legume family facilitated progress in the model species Medicago truncatula and Lotus japonicus and in soybean (Glycine max); and accentuated the need to change genomic information from the model species to cool-season pulses [pea (Pisum sativum), lentil (Lens culinaris), chickpea (Cicer arietinum), field bean (Vicia faba)], and warm-season food legumes [peanut (Arachis hypogea), common bean (Phaseolus vulgaris)], and forage legumes [alfalfa (Medicago sativa), clover (Trifolium spp.)](Mikic et al., 2009). This mission was codified further by 1) a third white paper, entitled: Legumes as a Model Plant Family: Genomics for Food and Feed; and 2) by the publication of the monograph, Legume Crop Genomics. These deliberations identified four tiers of legume species, each with particular genomic resources to be developed. Based on phylogenetic arguments, and particularly the range of synteny, two major foci of legumes were identified. In each of these two foci, one or two reference species were identified, M. truncatula and L. japonicus in the former and soybean in the latter(Young et al.,1990). Development of a full degree of genomics resources, including sequencing of the entire genome, was the highest priority for these reference species. For a second group, common bean and peanut, a broad range of genomic resources were recommended, including a physical map, BAC-end sequencing and marker development, anchoring of the genetic and physical map, ESTs of the major organs, chip resources, and sequencing of gene rich regions. A third group consisted of all other legume crops in the two foci, which includes pea, lentil, chickpea, field bean, clover, cowpea (Vigna unguiculata), and pigeon pea (Cajanus cajan). For these legumes, translational genomic tools were to be developed, principally for cross-legume markers, species-specific recombinant inbred lines, genetic maps, EST and BAC libraries. A fourth group included other legumes not in the two major foci, such as members of the basal legume clades(Odumodu, 2010). Genomic level analysis in different stratas were carried out, Physical map. A double-digest-based map for the cultivar 'Forrest' was constructed , on which work continued to reduce the number of contigs (presently >3,000 contigs) and to add additional DNA markers (e.g., through BAC-end sequencing); EST sequences. Over 300,000 soybean EST sequences were deposited in Genbank. Proteomic efforts were underway to apply translated EST sequences to protein identification.Soybean transformation and mutagenesis. Contrary to a NRC report , soybean transformation efficiencies were consistently >5% and, in some labs, efficiencies >12% were common. These improvements in transformation efficiencies led to development of transposon tagging projects for soybean, viral-induced gene silencing systems and tilling populations for soybean(Wang et al.,2004). Soybean also had over 300 phenotypic mutants; some of which were leading to marketable traits (e.g. modified oils, low phytate); Phenotype analysis. Soybean biochemistry, physiology and agronomic knowledge of soybean far exceeded that of any model legume. QTL discovery for synthesis, protection and quality traits were integrated with the genetic and physical maps. These genomic resources firmly underpinned the status of the Soybean research community and helped broker international collaboration in soybean genomics with scientists in Japan, China, Korea, and various countries of South America and Europe. In addition, forums such as the biennial Cellular and Molecular Biology of Soybean Conferences helped improve communication on an interdisciplinary level(Wilson et al.,1992).

CONCLUSION

Various research carried out on soybean and to make much efficient soybean with Plant Genomics, Committee on Science, National Science & Technology Council. Implementation of a coordinated strategies for research & development of genomics across the legume family. Soy bean has copious energy source and is included as nutaceuticals dieticians. It has various application and benefits for human beings.

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