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IPM and Organic Farming

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Abstract

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Organic farming has been increasingly spreading in recent years not only globally but also in the Arab countries. Organic farming is a system of production that uses practices and materials which are naturally/biologically enhancing to the soil, plant life, animal and human consumers and growers. Organic farming is based on producing food in a sustainable manner without using synthetic chemicals, either at the growing stage or post–harvest. Generally, the sales of organic products have increased 20% annually since 1990. Crop production and pest control methods in organic agriculture are governed by strict standards and rules imposed by the International Federation of Organic Agriculture Movements (IFOAM) and national regulations. Unfortunately, enhancement of soil quality and cultural practices are not always effective for controlling pests in organic agriculture. Therefore, IPM is essential in organic agriculture because it offers a wide range of techniques and practices to prevent or minimize damages from pests without affecting soil, water or beneficial organisms. Thus, IPM is not just about management of pests alone, it is a sustainable crop production approach based on sound eco-system analysis. However, this approach has certain constraints or challenges such as: (i) IPM is still not suitably recognized as policy or a solution to some problems, and the area of concern will need more personal attention especially in developing countries, (ii) implementation of this system is labor-intensive which is not widely available, (iii) growers, in some years, may suffer from crops damage and reduced yield to a larger extent than expected, (iv) there is no effective non-chemical control method or bio-control agent available for some pests (insects, weeds or pathogens), and (v) available funds for research in this area is limited. To overcome such constrains and improve the effectiveness of IPM programs through better understanding of the crop ecosystem both above and below the soil surface is needed. Furthermore, new systems for organic agriculture need to be designed, where the crop environment discourages pest development. The role of training of organic farmers and farm groups will be emphasized.

Key words: Organic farming, Adoption, Biointensive IPM, Arab region

Introduction

Recent years have seen an increased demand for food produced organically. It is well known that the ethos of organic production is based on producing food in a sustainable manner which has not been treated with chemicals, either at the growing stage or post – harvest when the produce is processed, packed, stored and distributed. So, most control operations employing pesticides are either restricted or not permitted at all in organic products. Crop production and pest control methods in organic agriculture are governed by strict standards and rules imposed by the International Federation of Organic Agriculture Movement (IFOAM) and national regulations. These standards are not constant, but are continually developing and evolving in response to advances in understanding, technical innovation, expansion of the production base and other new developments (4). The principles of pest control in organic farming are based on: (i) prevention of infestation, (ii) avoiding the contamination of organic foods by any form of infestation, (iii) avoiding any contamination of organic foods with plant protection products, and (iv) the use of substances which not adversely affect the environment. Consequently, IPM is not just about management of pests alone, it is a sustainable crop production approach based on sound eco-system analysis. However there are certain challenges that constrain its wide range implementation (3, 7).

This paper focus on the need to overcome these constrains and to implement bio-intensive IPM in the Arab region.

IPM Levels of Adoption in the Arab Region

Since the concept of IPM has been known around the mid 1970's until now, at least 77 definitions of IPM have been recorded. Some of these definitions have evolved to justify the use of pesticides, rather than to examine and implement pesticide alternatives. The most common definition of conventional IPM is a decision-making process that uses all available pest management tactics to prevent economically damaging pest out breaks while reducing risks to human health and the environment. The actual implementation of IPM in the Arab region indicates that there are 3 categories of adoption, with the exception of chemical control level with no IPM practices (or no IPM) are employed and the system is essentially dependent routinely on pesticides. The unique characteristics of the three categories are: low–level IPM, where farmers employ at least the most basic IPM practices-scouting and applications in accordance with economic threshold; medium–level IPM, where farmers adopt some preventive measures, coupled with efforts to cut back on broad spectrum pesticide use and protect beneficial organisms and high–level IPM, where farmers have integrated multiple preventive practices to control pests without relying on pesticides such as in organic farming. The high–level IPM is the most advanced IPM and termed as the bio-intensive or bio IPM (Figure 1). The current IPM adoption levels in each Arab country are not well known. This may require to overcome the limitations that should be recognized as well as accurately define the present situation to establish the bio-IPM. The most important constraints or IPM challenges in Arab region includes:

1. IPM is still not suitably recognized as policy or a solution to some problems, and the area of concern will need more personal attention.
2. Implementation of this system is labor-intensive which is not widely available in certain countries.
3. Growers, in some years, may suffer from crops damage and reduced yield to a larger extent than expected.
4. There is no effective non-chemical control method or bio-control agent available for some pests (insects, weeds or pathogens).
5. Available funds for research in this area are limited.

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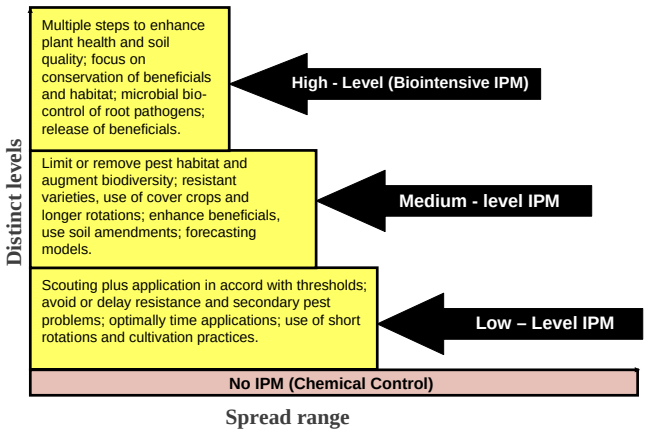

Figure 1. Categories of IPM adoption in Arab region

Successful Implementation of Biointensive IPM

Planning the program

Biointensive integrated pest management (bio IPM) is a system approach to pest management that is based on an understanding of pest ecology. It begins with steps to accurately diagnose the nature and source of pest problem, and then relies on a range of preventive tactics and biological measures to keep pest populations within acceptable limits. Reduced risk pesticides are used if other tactics have not been adequately effective, as a last resort and with care to minimize risks. Generally, IPM systems must respond to and or affected by several factors: economic costs and benefits of individual components; emergence of new pests, resistance or unusual weather problems; the skill and competence of field personnel conducting scouting, designing tactics and assessing effectiveness of given strategies; the impact or importance of preventive practices; availability, or lack thereof of effective alternative pest management products; and the complexity of interactions among pests, beneficials, cropping practices and control measures. Moreover, all IPM programs regardless of the situation, share the following components: monitoring the pest population and other relevant factors; accurate identification of the pest; determining injury levels and threshold that trigger treatment; timing treatments to the best advantage; spot-treating for the pest; selecting the least disruptive tactics; evaluating the effectiveness of treatment to fine–tune future actions and educating all people involved with the pest problem.

Good planning must precede implementation of any IPM program, but is particularly important in a biointensive program. Planning should be done before planting because many pest strategies require steps or inputs, such as beneficial organism habitat management that must be considered well in advance. Attempting to jump-start an IPM program in the beginning or middle of a cropping season generally does not work.

IPM options may be considered proactive or reactive (Figure 2). Proactive options need to answer the following questions when planning IPM program: What effects does soil quality have on plant attractiveness and susceptibility to insect pests and damage? What are options for better soil management (cover crops, green manures, adding compost, reduce tillage, etc)? What cultural or habitat options can be implemented before the crop is planted? What are crop rotations and their effect on pest management (insects, weeds and plant pathogens)? What are cover crop options and their effect on pest management? What pest resistant cultivars should be selected (resistant to major pests, appropriate for the area and commercially available)? On the other hand since IPM requires continuous assessment of a situation (6), there are certain key question that must be answered before implementing any management strategy such as: Is treatment necessary? Where should the treatment take place? When should action be taken? and which tactics should be used? The answer to these questions require to emphasize that the mere presence of a pest doesn't necessarily warrant treatment. Some times a fairly large population of pests can be tolerated while in other times the presence of a single pest is intolerable. In addition, the determination in treatment will vary among individuals. Also, pest managers must look to the whole system to determine the best place and timing to solve the problem. A successful IPM program is based on taking "a whole system" or eco-system approach to solve a pest problem (9). We must think of both the living and non-living components when determining which approach to take, and each component has impact on every other component (2).

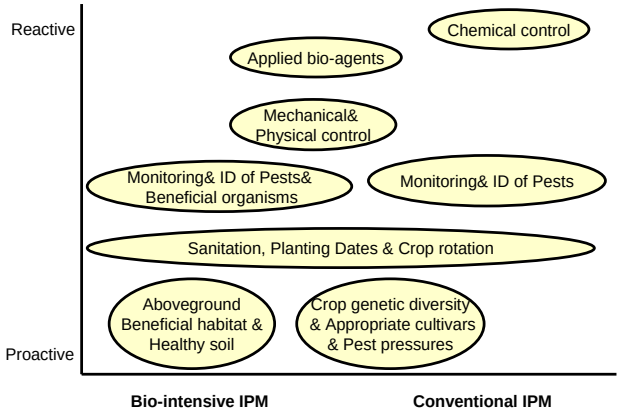

Figure 2. Proactive and reactive options of IPM (Adapted from: ATTRA)

Agro – ecosystem analysis (AESA)

The occurrences of pests and/or injury symptoms depend on the crop development stage and the environmental factors. Different pests attack different crop growth stages and different plant parts. These variations illustrate the need to Agro–ecosystem analysis (AESA) through the crop season. The objective of AESA is to build awareness of relationship that exist between organisms in the environment and to make good management decisions. The AESA should be done weekly to monitor conditions of crop, weather, soil, pests (including diseases and weeds) and beneficial organisms (predators and parasites). To make proper AESA, it is highly recommended to spend some time discussing the needed information, observations and recording results. This discussion should lead to the right way to observe the crop, selection and number of observed plants. In field observation, represented sample plant should be carefully observed for the presence of any larger pests, beneficials, injury symptoms and signs on the different plant parts (leaves, stem, roots, flowers and fruits). Soil surface should also be observed for any ground – dwelling pests or beneficials. Usually three leaves from the different levels (top, middle and bottom) of each sample plant are picked or turned to count small pests (such as aphids, white flies and mites) and associated

organisms, as well as different leaf spot disease symptoms by using a hand lens on both leaf sides. The results should be recorded on AESA chart or presented in inspection table. For example Figure 3 illustrate AESA chart for sweet pepper. The whole plant with all parts drawn in the middle, insect pests found drawn on the left hand side of the plant, and on the right - hand side of the plant draw the beneficials, disease symptoms, description of general condition of the plant and environmental factors and the last weeks management practices.

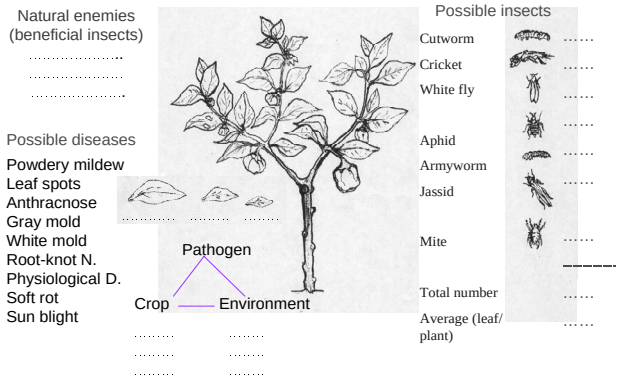

Figure 3. Agro – ecosystem analysis chart for sweet pepper.

Choosing practices/ tactics

Organic control practices for the main pests (i.e. insects, diseases and weeds) are based on non-chemical sanitation, physical, mechanical, cultural, and biological means as well as organically permitted products, including approved chemicals. Since no single practice is effective for all possible pests that threaten the crop, a combination of such practices is necessary. Some management practices should be carried out before the crop is planted and others later in the season. The successful management of insect pests includes pest prevention, early detection, correct identification, proper selection of control techniques and correct application methods (10, 11). The following practices could be suggested to prepare the growing season: site selection, early removing of vegetation, selecting high quality seeds and transplants. At planting time, selecting the suitable date, use of companion plants and diversified planting (rotation) to reduce insect injury are considered very effective practices. During the growing season there are number of practices to maintain healthy plants include adequate fertilizing, irrigation, mulch, harvest produce at timely intervals and remove old plants. Preventive devices and handpicking insects and egg masses insures quick and positive measures. Sticky colored yellow, black light and pheromone traps are excellent trapping techniques and can be used as survey tools, and may be offer protection to plants. These practices could make fields unattractive to pest species. However, at times this may be not enough when the levels of pest population or damage are not acceptable. The use of bio-pesticides includes microbial products, botanicals and biochemical insecticides in these cases are necessary practice (List 1).

List 1. Permitted and restricted pest management tools in organic farming.

Permitted	- Botanical products.
- Carbon dioxide, nitrogen, freezing, heating and vacuum treatment.	- Microbial products.
- Mechanical, sound or light barriers.	- Organically approved chemicals (Bordeaux mixture, sulfur and copper)
- Electric flying insect control units.	Restricted
- Tamper resistant bait stations.	(Substances used only in case of immediate threat to organic foods becoming unfit for consumption due to infestation)
- Pheromone traps & sticky boards.	- Pyrethrum derived only from a natural source.
- Diatomaceous earth & amorphous silica.	- Synthetic pyrethroids for the treatment of sealed units.
- Particle film barriers (processed kaolin clay).	
- Sugar esters	
- Compost teas.	

The role of the pest manager and the growers in IPM continuum

The manager must integrate his knowledge about pest biology and ecology with tools and techniques of biointensive IPM to manage not one, but several pests. A more accurate title for the pest manager is “ecosystem doctor,” for he or she must pay close attention to the pulse of the managed ecosystem and stay abreast of developments in IPM and crop/pest biology and ecology. In this way, the ecosystem manager can take a proactive approach to managing pests, developing ideas about system manipulations, testing them, and observing the results. On the other hand, it should be emphasized the role of organization of organic growers in organizing farmers into groups for learning and implementing new practices and systems as a key feature of successful program (1, 5, 12).

Consumer Awareness of IPM/ Organic Produce

With time, the opportunity of IPM/organic produce is increasing. Some studies indicated that consumers would preferentially purchase IPM or organic produce over produce grown using conventional pest control methods if labels/information were provided to reflect management practices (8). IPM label is an effort of food labelling which signifies that the food was grown using IPM practices. Recently there is a new labelling effort developed to use as a standard in growing and selling IPM apples, mushrooms, sweet corn and tomatoes.

Conclusion

To overcome IPM constrains and improve the effectiveness of current programs is needed. Furthermore, new systems for organic agriculture need to be designed, where the crop environment discourages pest development. Also, the role of training of organic farmers and farm groups should be emphasized as key feature of successful programs in learning and implementing new practices. Meanwhile, the IPM continuum could be achieved according to the following action plan:

1. Define an appropriate IPM continuum for the country or the region.
2. Establish at what stage we are now.

3. Establish realistic objectives in consultation with all stakeholders.
4. Recommend action to industry and government.
5. Establish new positions of crop management specialists.
6. Recruit professionals with research and extension expertise in the area of bio - intensive IPM.

الملخص

الزميتي، محمد السعيد صالح. 2006. الإدارة المتكاملة للآفات والزراعة العضوية. مجلة وقاية النبات العربية. 24: 174−177.

تزايد الاهتمام بالزراعة العضوية وزاد انتشارها في السنوات الأخيرة ليس على المستوى العالمى فحسب، بل على المستوي العربي أيضاً. وهي نظام للانتاج تستخدم فيه العمليات أو المواد المعززة لحيوية التربة، لحياة وصحة النبات و الحيوان، و المستهلكين والمزارعينأيضاً. وترتكز مبادئ الزراعة العضوية على انتاج الغذاء باسلوب مستدام لا تستخدم فيه الكيماويات سواء في مرحلة الإنتاج أو مابعد الحصاد. وتزايدت مبيعات المنتجات العضوية بصفة عامة وتزايد الطلب عليها بنسبة 20% في المتوسط منذ عام 1990. ويحكم انتاج المحاصيل العضوية و مكافحة آفاتاتها مقاييس صارمة وقواعد يفرضها الاتحاد الدولي لحركات الزراعة العضوية IFOAM والقوانين الوطنية. ولسوء الحظ فإن تعزيز جودة التربة والعمليات الزراعية لاتكون دائما فعالة لمكافحة الآفات في الزراعات العضوية، ولذا فإن الإدارة المتكاملة للآفات IPM تعتبر أساسية في هذا المجال حيث أنها توفر إلي مدى بعيد تقنيات وعمليات تجنب أوتقلل الضرر الناشئ عن الآفات لأقل حد ممكن بدون التضحية بجودة التربة، المياه، أو الكائنات النافعة. وبالتالي، فإن الـــ IPM ليست فقط استراتيجية لإدارة الآفات، ولكنها إنتاج مستدام للمحاصيل مبني علي التحليل والأسس البيئية. ومع ذلك، يعترض هذه التقنية بعض التحديات أو المعوقات التي ينبغي إدراكها، ومنها: (1) لاتزال الـــ IPM غير مدركة أو مسلم بها بدرجة مناسبة كسياسة أو كحل لبعض المشاكل، كما أنها تحتاج لاهتمام أكبرعلي المستوى الشخصى وخاصة في الدول النامية؛ (2) يتطلب تنفيذ النظام جهداً وعملاً مكثفاً قد لايتوافران علي النطاق الواسع؛ (3) قد يواجه المزارعون في بعض السنين بأضرار للنبات وانتاج أقل بصورة أكبر مما هو متوقع؛ (4) قد لاتتوافر طريقة أو مادة للمكافحة غير الكيماوية لبعض الآفات (الحشرية، العشبية، أو مسببات الأمراض)؛ و (5) محدودية التمويل المالي للبحوث. ولاشك أن هناك حاجة للتغلب على مثل هذه المعوقات وتحسين فعالية برامج الـــ IPM من خلال فهم أفضل للنظام البيئي للمحصول سواء فوق أو تحت سطح التربة، وذلك علاوة علي الحاجة لإيجاد برامج محسنة جديدة للزراعة العضوية في بيئات المحاصيل المشجعة لتطور الآفات، والأخذ بميزة الفرص التسويقية للمنتجات الزراعية. كما أنه يلزم التـــاكيد علي دور تدريب المزارعين العضويين أو مجموعات المزارعين كمقوم أساسي في تعلّم وتنفيذ العمليات أو الإجراءات الجديدة.

كلمات مفتاحية: الزراعة العضوية، الإدارة المتكاملة للآفات، اتخاذ، الإدارة المتكاملة مكثفة الحيوية للآفات، المنطقة العربية

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