

Original Article

Agronomic Performance of Peanut (*Arachis Hypogaea* L.) Using Alpha Naphthalene Acetic Acid (ANAA) With Different Mulching Materials under Clay Soil Condition, Isabela, Philippines

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Abstract: The agricultural sector is confronted with a significant challenge in the cultivation of peanut crops, characterized by persistently low productivity that leads to diminished yields and economic setbacks for farmers. This pressing issue not only hampers the overall output of peanut cultivation but also poses financial hardships for farmers who heavily rely on this crop for their livelihoods. This study investigated the effects of different rates of Alpha Naphthalene Acetic Acid (ANAA) combined with various mulching materials on peanut cultivation under clay soil conditions. Implemented in a Randomized Complete Block Design (RCBD), the experiment employed eight treatment combinations, incorporating two mulching materials (plastic mulch and rice straw) and four ANAA concentrations (control, 300 ml, 350 ml, and 400 ml). Results indicated that ANAA application increased plant height and biomass yield, though not significantly. Rice straw enhanced the number of pods and the weight of 100 seeds, albeit without statistical significance. Rice straw combined with 400 ml of ANAA demonstrated notable increases in pod number and seed weight. Plastic mulch with 300 ml of ANAA significantly impacted biomass yield, while rice straw surpassed plastic mulch in pod yield. ANAA usage also boosted pod yield compared to the control. Return on Investment (ROI) analysis highlighted the profitability of rice straw combined with 400 ml of ANAA. The study suggested the effective utilization of rice straw mulch and ANAA without compromising peanut yield and quality. In the cost and return analysis, it was observed that the application of 400ml ANAA with rice straw achieved the highest return on investment, suggesting its efficacy for peanut production. Based on these findings, recommendations were made, including the use of ANAA with rice straw at a rate of 400 ml every 15 days for optimal peanut production, the avoidance of waterlogging during pod development, and further studies on different soil types and peanut varieties to assess the efficacy of ANAA and mulching materials. Additionally, the study suggests exploring varietal differences in the effects of these factors for more comprehensive insights into peanut cultivation practices.

Keywords: mulching, clay soil, plastic mulch, pod and arachis

1. INTRODUCTION

Peanut (*Arachis hypogaea* L.) locally known as “mani” belongs to family Fabaceae. It has high protein content which ranges from 22-30% of its total calories, making peanut a great source of plant-based protein. It also contains high amount of minerals, antioxidants and vitamins (riboflavin, niacin, vitamin B-6 and folates) [1]. In the Philippines, peanut is considered as one of the major field legumes grown by local farmers [2]. However, its production has been low and erratic with a national average yield ranging only from 800 to 1,000 kilograms per hectare. Nevertheless, peanut production remains profitable

when proper cultural management is employed. Weeds growing along with crops deplete considerable amount of nutrients and soil moisture resulting to poor crop growth. Hence, weed control is an important consideration in crop production. Studies [3,4]. showed that mulching could be an effective cultural management in controlling weeds and conserving soil moisture. Mulches like rice straw and rice hull suppress weed growth and conserve soil moisture. They also suppress multiplication of weeds during the early stage of crop growth [5]. Mulching as a method of weed control could be an alternative to herbicide application. It also helps build up the organic matter content of the soil as mulch decays and improves crop growth. Mulching can be done using indigenous and locally available materials like rice straws and rice hulls. These farm byproducts are available in all rice farm communities and can be utilized not only to suppress weed growth, conserve soil moisture but also as sources of nitrogen especially when they are completely decomposed [6]. Moreover, according to [7], mulching was able to increase the length of main vines, leaf area index and fresh herbage weight of sweet potato. The mulch is used to cover the soil before weeds can emerge to maintain good growth of peanut and other field crops [1]. Moreover, the practice of mulching is important to minimize crop weed competition. Weed invasion reduces crop yield up to 70% depending on weed population. Another advantage of mulching is that it reduces soil evaporation during dry periods as much as 75%. It also activates earthworm and helps aerate the soil. Weeding operation is time consuming. Out of the total labor input of African women in rice production, 40-60% is spent on weeding [8]. When mulching is used, reduction on weeding expenses could be attained. The agricultural sector is confronted with a significant challenge in the cultivation of peanut crops, characterized by persistently low productivity that leads to diminished yields and economic setbacks for farmers. This pressing issue not only hampers the overall output of peanut cultivation but also poses financial hardships for farmers who heavily rely on this crop for their livelihoods. The combination of factors contributing to the suboptimal productivity of peanut crops necessitates comprehensive and strategic interventions to enhance agricultural practices, optimize resource utilization, and ultimately bolster the economic resilience of peanut farmers. Consequently, it is imperative to conduct research on the growth and yield of peanut crops in order to identify viable approaches to enhance their productivity. Peanuts, scientifically known as *Arachis hypogaea* L. are a highly nutritious and economically important grain legume crop that is extensively cultivated in the Philippines. Locally known as "mani," peanuts are a popular snack item and a versatile culinary ingredient due to their flavor, aroma, crunchy texture, and high energy level [9] The crop is utilized in various forms, including peanut oil, boiled peanuts, roasted peanuts, peanut butter, and peanut meal, which are incorporated into snack foods, chocolates, and energy bars. Peanuts are a rich source of vitamins, minerals, antioxidants, and nutrients that are crucial for maintaining good health [10]. On the other hand, plant hormones, are organic compounds that are distinct from nutrients and can promote, inhibit, or modify any physiological process in plants at low concentrations. There are five well-known categories of classical phytohormones: auxins, gibberellins, cytokinin, abscisic acid, and ethylene [11] One of the ways to improve the growth and yield of peanut is by using plant hormones like Alpha Naphthalene Acetic Acid (ANAA), which improve the pods, seeds, branches and development in roots of legumes. Mulching is another agricultural practice that is known to enhance the growth and yield of crops. Mulches like rice straw and rice hull suppress weed growth and conserve soil moisture. They also suppress multiplication of weeds during the early stage of crop growth [12] Utilizing plant growth regulators, such as Alpha Naphthalene Acetic Acid (ANAA), represents one approach to bolster peanut growth and yield. Additionally, mulching with materials like rice straw and rice hull can enhance crop growth by inhibiting weed proliferation and preserving soil moisture. [13]. investigated the impacts of ANAA and mulching methods on cashew growth and yield. Their findings suggest that applying ANAA alongside mulching led to increased nut yield, plant height, and nut count per plant. Nevertheless, determining the optimal combination of ANAA concentration and mulching technique may hinge on environmental variables, underscoring the significance of site-specific research. This study is to evaluate the agronomic performance of peanut production as influenced by ANAA and different mulching materials in clay soil condition.

2. MATERIALS AND METHODS

This study was conducted at Isabela State University, Cabagan Campus, College of Agricultural Sciences and Technology (CAST) compound, Cabagan Isabela. The materials, supplies, and equipment utilized included peanut seed variety (NSIC-Pn09), obtained from Lanna, Enrile, Cagayan. Inorganic fertilizers, such as Complete fertilizer (14-14-14), Urea (60-0-0), Muriate of potash (0-0-60), lime (Calcium carbonate), and legume inoculant, were purchased from an agricultural supply. Moreover, Alpha Naphthalene Acetic Acid, yellow sticky traps, and plastic mulch were obtained from a duly authorized online store. Meanwhile, the hand tractor, wheelbarrow, garden tools, placards, pegs, meter stick/measuring tape, and sprayer were obtained from the nursery located on the school campus. The study first determined the soil profile and topography of the area, employing a zigzag pattern for soil collection. Gathering soil sample was done of 6-8 inches, and composite samples were extracted to represent the entire region. Unnecessary debris, weeds, and topsoil were removed according to the pattern, and a shovel was used to collect soil samples, while a bucket was used to gather each soil sample. The soil samples were pulverized and air-dried for 7 days. Quartering was performed to acquire half a kilogram (kg) of soil, and the samples were then forwarded to the Department of Agriculture Cagayan Valley Integrated Agricultural Laboratory (DA-CVIAL) for analysis. In conducting the study, a total area of 341 square meters was employed. The land was prepared by plowing it twice with a four-wheeled tractor, followed by a final harrowing conducted 3 weeks before sowing, using a hand tractor to clear the area of unnecessary debris and weeds. The designated space was divided into three columns for three replications and eight rows for eight treatments, following the experimental layout outlined with straw lace. Shovels and hoes were used by researchers to create 3 meters (m) by 3 meters (m) plots, establishing drainage and alleyways. Following the plotting, levelling was carried out using a garden rake to eliminate excess soil and weeds before planting. In conducting the study, a total area of 302.5 square meters was utilized. This area was divided into three equal blocks, spaced 0.5 m apart with 1 meter between replications. Each of these blocks was then further subdivided into eight equal plots, each measuring 3 m by 3 m. The study was designed using a 2 x 4 factorial experiment in a Randomized Complete Block Design (RCBD). The experiment involved 8 treatment combinations designated as T1 through T8. Treatments T1 to T4 utilized plastic mulch with various concentrations of ANAA, while treatments T5 to T8 employed rice straw with different ANAA concentrations. Treatment 1 (T1), identified as A1B1, utilized plastic mulch without ANAA. Subsequent treatments included T2 (A1B2), applying plastic mulch with 300 ml of ANAA per hectare, T3 (A1B3) with plastic mulch and 350 ml of ANAA per hectare, and T4 (A1B4) incorporating plastic mulch with 400 ml of ANAA per hectare. Meanwhile, T5 (A2B1) employed rice straw without ANAA, T6 (A2B2) utilized rice straw with 300 ml of ANAA per hectare, T7 (A2B3) applied rice straw with 350 ml of ANAA per hectare, and finally, T8 (A2B4) utilized rice straw with 400 ml of ANAA per hectare. These treatment combinations allowed for a comprehensive investigation into the effects of different mulching materials and ANAA concentrations on agronomic performance of peanuts. The study utilized plastic mulch and rice straw as mulching materials. For plastic mulch, 10 m were used to cover the 3 m x 3 m plot, while for rice straw, 5-centimeter (cm) thickness of rice straw was utilized. These mulches were spread evenly over the plot to cover the entire area and were watered to help the mulch settle and adhere to the soil. This was done after the final harrowing or before planting peanuts. It implemented an inorganic and organic fertilizer application based on the soil analysis recommendations from the Department of Agriculture Cagayan Valley Integrated Agriculture Laboratory (DA CVIAL). Organic fertilizers, namely carbonized rice hull and vermicompost, were applied at a rate of 449 grams (g) per plot. Inorganic fertilizers, including Urea (46-0-0), Muriate of Potash (0-0-60), Complete Fertilizer (14-14-14), lime (Calcium Carbonate), and legume inoculant, were used with application rates of 29.61 g, 39.47 g, 128.29 g, 2.7 g, and 1 kg of inoculant per 5 kg of peanut seeds, respectively. Application occurred only once during planting (basal), while lime was applied using the broadcast method 2 weeks before sowing. The seeds were sown directly in the furrows at a depth of 2-5 cm, and they were covered right after planting with well-pulverized soil. Each plot had 7 rows with a seeding rate of 26 seeds per hill (following a 2 seed/hill planting) with a planting distance of 50 cm between rows and 20 cm between hills. It employed these methods upon noticing a high rate of unsuccessful germination of seeds, leading to numerous missing

hills, particularly in plastic mulch. The initial replanting occurred 10 days after sowing (DAS) through the soaking method. However, even at 25 DAS, a few hills remained missing, particularly in the plastic mulch. Consequently, the researchers implemented the refilling of the missing hills. Before refilling, they utilized the ragdoll method, where the cotyledon emerged, employing paper towels. This approach enabled the refilled hills to catch up with the germination of the first replanted peanuts, resulting in a more uniform and faster germination rate of the peanut seeds. The researchers concluded that, when planting peanuts, the ragdoll method is preferable to the soaking method. The application of ANAA was initiated 15 days after sowing (DAS) and continued for another 15 days, with the final application occurring at 45 DAS. Table 1, displays the different concentration and rate of ANAA applied based on DAS, with the researchers using 300 ml of water as the required measure for diluting ANAA per concentration. It initially utilized flooding irrigation in the dikes, employing a hose connected to a submersible pump. This irrigation method was performed once a week due to the presence of mulching materials. However, upon observation of the flooding irrigation, it was noted that the dikes in the area became excessively moist, leading to weed emergence. Furthermore, watering the soil in the plot only once a week resulted in soil compaction and numerous missing hills. To address these issues, immediately switched to manual sprinkler irrigation, utilizing a drum bucket to collect water. This new method was implemented daily, late in the afternoon. Manual weeding was performed using a garden knife and scythe before every application of ANAA (15, 30, and 45 DAS), during peg development (60 DAS), and during pod development (80 DAS). Additionally, in the border of the area, the researchers utilized a mechanical grass cutter to clean and cut the large weeds outside the area. The researchers determined the types of weeds that emerged in the area, such as bermuda grass (*Cynodon dactylon*), sensitive plant (*Mimosa pudica*), rice (*Oryza sativa*), flatsedge (*Cyperus iria*), barnyard grass (*Echinochloa glabrescens*), fimbriatylis (*Fimbristylis gaudich*) and purple nutsedge (*Cyperus rotundus*). During the flowering and vegetative stages, Cowpea Aphids (*Aphis craccivora*) infested peanuts under plastic mulch and rice straw, causing leaf yellowing of the plants. Botanical insecticides, consisting of 4 drops of dishwashing liquid and 2 tablespoons of vinegar, diluted in 1 liter of water, were used for control. In the vegetative stage, bean leaf beetles (*Cerotoma trifurcata*) infested plots with various mulching materials, leading to leaf damage and stem wilting, and they were managed by placing yellow sticky traps per plot. Lastly, the presence of Chlorotic rosette disease, due to the Cowpea aphid vector, was controlled by manually uprooting the affected plants. The study utilized the cultural practices of manually lodging peanuts to assist the pegs in penetrating the soil during pod development. It was implemented during the pegging or early pod development stage (70 DAS) of the crops. Peanuts were harvested at 100 days after planting when the pods attained maturity. This was indicated by the inner pod cover starting to turn black. Due to continuous heavy rain, and some plants were not yet mature, the researchers decided to harvest at 120 DAS. Harvesting was done by manually pulling off the plants with the use of a shovel. Fourteen (14) sample plants were initially randomly selected in each plot. However, researchers later excluded the two (2) highest and two (2) lowest sample plants following data collection to eliminate potential errors, resulting in a final count of ten (10) sample plants. Consequently, the following data was obtained: Plant height (cm) – this was taken by measuring the height of 14 randomly selected sample plants from the base up to terminal bud after 100 days (where its final stage). Biomass yield (g) - biomass yield was taken by weighing the whole fresh uprooted peanut sample plant with the pods. Number of pods harvested per sample plant – this was taken after harvesting, pods will be counted to get the total number of pods per sample plant. Computed yield (kilogram/hectare) – The yield of the peanut plant in every 1 square meter quadrant of different treatments was weighed and recorded after drying and converted in per hectare basis (shelled). The yield per hectare was calculated using the formula: $Y = \text{Yield per } 1 \text{ m}^2 \times 10,000 \text{ m}^2$. Weight (g) of 100 seeds – dried peanut seeds were randomly selected per treatment and weighed using a digital weighing scale. Classification of seed based on size – 100 grams of peanut seeds was classified based on the PNS standard (Table 02). To determine it sizes (small, medium, big). Cost and Return Analysis- The Cost and return analysis of using ANAA on peanut production was done. Assumptions on the cost of farm inputs (fixed and variable costs) were determined based on current prices in the locality. The cost and return

per treatment were computed. Analysis of variance was used to determine the level of significance ($p < 0.005$) using the computer program called SPSS Statistics. Analysis of variance was also employed to determine the level of significance ($p < 0.005$) for yield and plant height. Tukey's test at $p < 0.005$ for comparison of the differences between treatment means.

3. RESULTS AND DISCUSSION

As depicted in Table 03, Row 2 presents the interaction effect of different mulching material and different concentration of ANAA in plant height (PH) at 120 DAS. The mean PH ranged from 67.11 cm to 82.72 cm, with T5 (No ANAA with rice straw) exhibiting the tallest mean, followed by T8 (400 ml of ANAA with rice straw), T4 (400 ml of ANAA with plastic mulch), T7 (350 ml of ANAA with rice straw), T2 (300 ml of ANAA with plastic mulch), T6 (300 ml of ANAA with rice straw), T3 (350 ml of ANAA with plastic mulch), and the lowest mean obtained in T1 (No ANAA with plastic mulch) at 67.11 cm, 70.46 cm, 73.10 cm, 74.24 cm, 76.89 cm, 78.44 cm, 81.13 cm, and 82.72 cm, respectively (Figure 02). However, the interaction effect of different mulching materials and varying concentrations of ANAA on PH at 120 DAS did not reveal any significant differences among the treatments. An important note is that researchers should collect data on PH during the vegetative stage (formation of side shoots) and the harvesting stage to effectively assess the impacts of mulching materials and ANAA concentration on peanut PH. In Table 03, row 3 presents the Biomass yield (BY) at 120 days after sowing (DAS), influenced by the interaction effect of ANAA and different mulching materials. The highest BY was observed in T2, with a mean of 5917.30 g, followed by T8, T1, T7, T5, T4, T3, and T6, with means of 5502.33 g, 5165.33 g, 5090.63 g, 5082.50 g, 4920.17 g, 4749.97 g, 4335.50 g, respectively. However, ANOVA results revealed that T2 is statistically similar to T8, T1, T7, and T5, but significantly differs from T4, T3, and T6. Additionally, T4 and T3 are statistically similar, while T6 differs significantly from both. These findings indicate a significant interaction between the use of different concentrations of ANAA with various mulches. This is consistent with the findings of [6] in their study titled 'Response of Growth and Yield of Garlic cv. PG-18 against Various Plant Growth Regulators and Mulching along with Its Consortium', where the interaction effect of black polyethylene plastic mulch with NAA resulted in high fresh and dry plant weight in garlic. Similarly, [14] study found that among the different mulches evaluated, soil temperature was higher under plastic mulch, leading to the highest biomass compared to other mulches. However, the use of rice straw could accelerate maturity but might lead to lower BY, consistent with [15] study, which demonstrated that rice straw reduced the fresh and dried biomass yield of different crops. Based on Table 03 row 4 illustrates the interaction effect of different mulching materials and various concentrations of ANAA on the number of pods per sample plant (NP), with means ranging from 26.90 to 36.97. T8 recorded the highest NP per sample plant with 36.97, while T1 obtained the lowest NP with 26.90. ANOVA demonstrated that there is no significant difference between treatments. The lack of significance is specifically linked to environmental factors, notably high temperatures, which contribute to reduced water availability in the soil and make peg penetration difficult. This finding aligns with the study [16], which found that reduced water availability in the soil led to a significant decrease in peg viability in peanut crops. In Table 03 row 5 displays the interaction effect on the weight of 100 seeds (WS) influenced by different mulching materials and various concentrations of ANAA. The WS ranged from 43.67 g to 54.67 g across different treatments. T8 recorded the highest WS at 54.67 g, while T5 had the lowest WS at 43.67 g. The Analysis of Variance indicated a non-significant effect on the weight of 100 seeds. This lack of significance is attributed to environmental factors, particularly high temperatures, which may induce plant stress, making peg penetration into the soil difficult and resulting in a lower number of developed pods. This result aligns with the study by [17] which stated that drought and heat stress alone or in combination substantially lower the number of developed pods in peanut production. Table 03, row 6 presents the interaction effect of different mulching materials and various concentrations of ANAA on computed pod yield (CY), which exhibited no significant differences among the treatments. CY ranged from 1,246.67 kg to 1,690 kg, with T8 (400 ml of ANAA with rice straw) yielding the highest computed pods yield at 1,690 kg, while T1 (No ANAA with plastic mulch) yielded the lowest CY at 1,245.67 kg. The analysis of variance (refer to

Figure 6c) indicates no significant effect between the influence of different mulching materials and various concentrations of ANAA on CY [18]. This finding suggests that mulching materials and ANAA application had no discernible effect on the interaction of treatments in CY. Potential contributing factors include encountered waterlogging, particularly in the months of July and August during the experiment, coinciding with pod development and maturity stages. According to [19], the most susceptible growth stages of peanuts to waterlogging are the pod filling and maturity stages. This factor likely led to decreased NP per plant and pod weight, ultimately negatively impacting the interaction of treatments in CY. In table 03 row 7 illustrates the interaction effects of ANAA and different mulching materials on the seed size classification of peanuts (CS). T1 exhibited the highest seed count, with a mean value of 223.33, while T5 had the lowest seed count, with a mean value of 186. Analysis of variance indicated that there were no significant differences in the seed count among the different treatment groups. This finding suggests that all treatments resulted in a similar CS, which was classified as small-seeded. The cost and return analysis of peanut production per hectare as affected by the different treatment is reflected in Table 4. The application of T8 produced the highest Return on Investment (ROI), totaling a remarkable 86.34%. This outcome stands out as evidence of the potency of ANAA. T7, came second place with a good ROI of 79.76%. This result confirms the method's efficacy in increasing profitability (Table 04). On the other hand, the procedure used in T3, which excluded had the lowest ROI among all the treatments. The economic importance of applying different concentration of ANAA and different mulching material to peanuts depends on their ability to increase crop yield. This is because the higher the yield, the more profit the farmer will earn. Hence, the results of the economic analysis show that the application of ANAA with different mulching material have significant impact on the profitability of peanut production.

Table 01: Different concentration and rate of ANAA applied based on DAS

Days of Plants	Concentration/ha	Rate per plot
15, 30 and 45 DAS	300ml/ha	0.27 ml
	350ml/ha	0.32ml
	400ml/ha	0.36ml

Note: DAS- days after sowing; ml- millilitres; ha (hectare)

Table 02: The size classification of peanuts

Size classification	Counts/ 100gram peanuts (shelled)
Small	55-72
Medium	37-54
Big	20-36

Table 03: Interaction effect of different mulching material and different concentration of ANAA

Treatment	PH	BY	NP	WS	CY	CS
T1	67.11	5165.33 ^{abc}	26.90	45.67	1246.67	223.33
T2	74.24	5917.30 ^a	35.93	46.67	1380.00	197.67
T3	70.46	4749.97 ^{bc}	32.63	45.00	1266.67	211.67
T4	78.44	4920.17 ^{bc}	29.97	52.67	1450.00	211.00
T5	82.72	5082.60 ^{abc}	29.03	43.67	1280.00	186.00
T6	73.10	4335.50 ^c	30.00	50.67	1346.67	195.33
T7	76.89	5090.63 ^{abc}	30.47	53.00	1626.67	212.67
T8	81.13	5502.33 ^{ab}	36.97	54.67	1690.00	197.33
ANOVA	ns	**	ns	ns	ns	ns

Note: The lowercase letters (a, b, c) next to the values in the 'BY' column represent statistical groupings, indicating significant differences (or lack thereof) among the treatments. Values sharing a common letter do not significantly differ from each other statistically.

PH-plant height; BY- biomass yield; NP- number of pods; WS-weight of 100 seeds; CY- computed yield; CS- classification of seed.

Table 04: Cost and return analysis of peanut production with the application of different mulching materials and different concentration of ANAA

Treatments	Yield (kg/ha)	Cost of Production	Gross Income	Net Income	Return on Investment (%)	Rank
T1	1,246.67	19,835	31166.75	8,032	34.72%	7
T2	1,380.00	20,298	34,500	10,902	46.20%	5
T3	1,266.67	20,323	31,666.75	8,044	34.05%	8
T4	1,450.00	20,373	36,250	12,577	53.13%	3
T5	1,280.00	18,823	32,000	9,877	44.65%	6
T6	1,346.67	19,298	33,666.75	11,069	48.98%	4
T7	1,626.67	19,323	40,666.75	18,044	79.76%	2
T8	1,690.00	19,373	42,250	19,577	86.34%	1

4. CONCLUSION

The agricultural sector is confronted with a significant challenge in the cultivation of peanut crops, characterized by persistently low productivity that leads to diminished yields and economic setbacks for farmers. This pressing issue not only hampers the overall output of peanut cultivation but also poses financial hardships for farmers who heavily rely on this crop for their livelihoods. This study investigated the effects of different rates of Alpha Naphthalene Acetic Acid (ANAA) combined with various mulching materials on peanut cultivation under clay soil conditions. Implemented in a Randomized Complete Block Design (RCBD), the experiment employed eight treatment combinations, incorporating two mulching materials (plastic mulch and rice straw) and four ANAA concentrations (control, 300 ml, 350 ml, and 400 ml). Results indicated that ANAA application increased plant height and biomass yield, though not significantly. Rice straw enhanced the number of pods and the weight of 100 seeds, albeit without statistical significance. Rice straw combined with 400 ml of ANAA demonstrated notable increases in pod number and seed weight. Plastic mulch with 300 ml of ANAA significantly impacted biomass yield, while rice straw surpassed plastic mulch in pod yield. ANAA usage also boosted pod yield compared to the control. Return on Investment (ROI) analysis highlighted the profitability of rice straw combined with 400 ml of ANAA. The study suggested the effective utilization of rice straw mulch and ANAA without compromising peanut yield and quality. The study examined various growth parameters, yield parameters, and conducted a cost and return analysis to evaluate the effects of different factors on peanut production. Regarding growth parameters, it was found that neither plastic mulch nor rice straw significantly affected plant height or biomass yield. Additionally, the application of ANAA did not have a significant effect on plant height, but it did lead to significant differences in biomass yield. In terms of yield parameters, the type of mulching material did not significantly impact the number of pods, weight of 100 seeds, or seed classification, although it did affect computed pod yield. Similarly, different concentrations of ANAA did not significantly influence the number of pods, weight of 100 seeds, or seed classification, but did impact computed pod yield. The interaction between these factors did not show significant effects on treatment means. In the cost and return analysis, it was observed that the application of 400ml ANAA with rice straw achieved the highest return on investment, suggesting its efficacy for peanut production. Based on these findings, recommendations were made, including the use of ANAA with rice straw at a rate of 400 ml every 15 days for optimal peanut production, the avoidance of waterlogging during pod development, and further studies on different soil types and peanut varieties to assess the efficacy of ANAA and mulching materials. Additionally, the

study suggests exploring varietal differences in the effects of these factors for more comprehensive insights into peanut cultivation practices.

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